University News

MONDAY, AUGUST 29, 1988 **Rs. 1.50**

Prof. S.K. Agrawala, Secretary, AIU, awarding the Dr. B.L. Gupta Inter-University General Championship Trophy to Mr. D.K. Mudgal, Director of Physical Education, Delhi University. Seen on his left are Shri G.S. Sivia, Deputy Secretary, AIU and Prof. I.P.S. Monga, Chairman, Delhi University Sports Council.

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IN THIS ISSUE

Editor :
SUTINDER SINGH

Analysing Distance Learning Systems

K. G. Deshmukh*

"Challenge of Education : A policy perspective" presented to Lok Sabha in 1985 by the Prime Minister have clearly indicated the role of education in a rapidly changing national and international (Global) situation marked by new human needs and aspirations. It says..."Change rather than status quo, has become the watch word for successful living and education has been recognised as the tool for ushering in changes in an orderly manner. While education continues to be concerned essentially with individual development, its approach to this fundamental task is now conditioned by social concerns which have acquired a new significance with a view to reducing conflict and violence. Great wealth of experience has been accumulated about the modalities by which education can play the roles assigned to it. In this process, the concept of education itself has changed. It is no more confined to formal structures and institutions. The dynamics of expansion of knowledge has led to the concept of life long learning for the individual and the evolution of institutions of continuing education. A great deal has been discovered about the process of learning itself and its highly personalised character. The boundaries of the well-established disciplines of the past have given way to interdisciplinary teaching and research. New technologies have begun to be used widely both to enrich the quality and enhance the reach of education".[1]

This clearly indicates that our present system of education would have to be modified, so as to be widely open so that educational opportunities are made available to every one who wants education—children and adults, men and women, urban as well as rural and tribal population.

The new multifaceted education system suited to diversified interests of functionality cannot be confined to traditional structures and institutions. The system has to develop human resources for acquiring mastery over the skills and knowledge, areas essential for meeting the challenge of present technological society so as to improve the quality of life, both material and cultural. Education cannot be one time exposure to learning. It is "life long learning" : The concept adopted through 1972 UNESCO report, 'learning to be'. The concept embodies six important principles :

(1) "that dimensions of living experience must be restored to education by re-distributing teaching in *space and time*".
(2) "that education should be dispersed and acquired through multiplicity of means—the important thing is not the path an individual has followed, but what he has learned or acquired".
(3) "that the concept of general education must be broadened so that it definitely includes general socio-economic, technical and practical knowledge".
(4) "that educational action to prepare for work and active life should aim less at training people to practise a given trade or profession than at equipping them to adopt themselves to a variety of jobs, at developing their capacities continuously".
(5) "that life long education, in the full sense of the term, means that business and industrial firms will have extensive educational functions".

*Vice-Chancellor, Amravati University, Amravati.

(6) "that access to different types of education and professional employment should depend only on each individual's knowledge, capacity and aptitudes, and should not be a consequence of ranking or below experience gained during the practice of work".[3]

If taken seriously, the concept of life long education is a revolutionary idea of this century—which would include accessibility, institutional openness, need based learning, competency based education, cooperative education, and credits for prior learning. This, therefore, would mean that educational institutions will have to be developed as centres of life long learning; which probably will be extremely difficult.

The life long learning system envisages complete openness, as against relying completely on full time formal system. In India, the education commission (1964-66) sounded against the full time, formal system, saying :

"It has to be remembered that reliance on full time education as the sole channel of instruction often divides the life of an individual into 3 watertight and sharply divided stages; a pre-school stage of neither formal education nor work, a school stage of full time education and no work, and post school stage of full time work and no education. It is necessary to abandon the present policy of placing an almost exclusive reliance on full time education, and the two alternative channels of part time and own-time education should be developed on a larger scale at every stage and in every sector of education and should be given the same status as full time education. Secondly, adult and continuing education, which is almost totally neglected at present, should be emphasised to a very great extent. Taken together, these reforms would :

(1) enable those who have not completed a stage or education to complete it and, if they wish, to proceed to the next;

(2) help every educated person to have further education with or without formally enrolling himself in an educational institution;

(3) enable a worker to acquire knowledge, ability and vocational skill in order to be a better worker and to improve his chances of earning more; and

(4) help to refresh the knowledge of the educated person and enable him to keep pace with the new knowledge in the field of his interest."[3]

Towards Distance Education

The urge for higher education in industrial and post industrial society is increasing at phenomenal rate because of modern communication technologies. The report (1969) on UK Open University rightly says : "It is...unjust to the individual and unwise for the society to deny the greatest educational opportunity to the greatest number of its citizens. For long, regarded as the privilege of the few the opportunity to engage in higher education is atleast becoming widely accepted as a basic individual right. Moreover, education in general, and higher education in particular is, at one and the same time, a necessary condition of a modern technological society and defence against its abuse".[4]

New communication technologies are building up national and international information communication networks. The National Policy on Education referring to media and educational technology observes :

"Modern communication technologies have the potential to bypass several stages and sequences in the process of development encountered in earlier decades. Both the constraints of time and distance atonce become manageable. In order to avoid structural dualism, modern educational technology must reach out to the most distant areas and the most deprived sections of beneficiaries simultaneously with the areas of comparative affluence and ready availability".[5]

Because of planned development in communication technology, long standing assumption in higher education that information is a scarce commodity is no longer true. And hence the concept in the universities of teaching hours in their economic planning is getting blurred. As suggested by Dr. Morrison[6] learning hours is a better concept, for it opens up the possibility of self directed and other forms of learning and growth.

Distance education is emerging to prominence in different countries developed and under developed. This is because of number of fundamental changes occurring in the relationship between higher education and the society in which it is placed. These can be listed as follows :

(1) Traditional higher education no longer enjoys a monopoly on learning services.
(2) The distinction between education offered by higher education institutions, and training

offered by "industry" is difficult to maintain, and hence the roles and functions of educational institutions are increasingly blurred.

(3) Higher Education can no longer claim the full time commitment of students.

(4) Higher Education's basic assumption of an information deficit in society is being seriously challenged by new technology.

(5) There is continued incongruence between the reality of life long learning and institutional and system responses.[6]

From Access to Success

Distance learning system have been successful in demonstrating that increased access to learning can be obtained through such process. However, even today the system has more access to those who have good schooling and are academically well equipped. Hence the question arises, is their equal opportunity to all ? Removing barriers to access—time, space, cultural and social differences—has been the real concern of distance education. Flexible registration procedures, the use of communication technologies, regional centres, tutorial support and educational counselling services have to be used to remove access barriers and then only the distance education system would be a success. Equalising access does not necessarily equalise the chances of success for learners. Because of socio-economic-cultural differences of learners learning style will have to be modified to suit them. It is generally argued that, concentrating on *access and success* would generally lead to a decline in quality or excellence. But while thinking of imparting education in the system one must think of what is learned instead of how it is learnt. That is, disadvantaged students would take more time to learn than advantaged group. Hence quality or excellence should be thought of not in isolation, but at the level of outcomes. Thus in order to make the distance learning systems to be successful and purposeful, they must give equal opportunity to all in society, and must increase their efficiency in guaranteeing access and work in producing success. With these twin objectives in view 'innovative model' will have to be evolved so that distance learning system becomes really 'Open learning system'. The open learning system should be characterised by :

(1) The absence of a discriminatory entrance requirement.
(2) A result driven concept of equality.
(3) A success based concept of programme and service design.
(4) A multiple strategy and matching model approach to programme delivery.
(5) A developmental concept of quality.[7]

Learning Organisation

Distance education as an open learning system is unique in our educational world and requires organisational concept. It is an educational innovation. Its uniqueness rests in the management of how people learn. Models of distance education, then, reflect models of learning. Distance learning must be constantly innovative, finding out regularly new ways to link learners through processes to content. Institutions catering for distance learning must be innovative. The institutions at the university level must find out ways to accommodate traditional tendency within the academic culture with the innovative norms demanded by organisational culture. The need to develop appropriate and effective ways to manage this duality is most important.

Appropriate Model of Technology

Problems facing distance education is the need to develop a framework concerning the appropriate use of technology. New communication technologies give numerous opportunities for learning. Technology for the purpose is defined as the process of transforming inputs into outputs. The concept of technology is a social as well as mechanical process. All transformations of inputs into outputs occur in a social context and not in vacuum. Hence any decision taken or plans proposed for the introduction of new technology to the educational process must be undertaken with the social context of technology clearly in mind. In fact, what is really needed today are not more machine technologies, but more creative social technologies. The new technologies, like computers, satellite communication, video discs and telematic systems of various kinds increase not only the physical power of the human being, but his mental power and capacity. Technologies are created by human beings, even those applied to the transformation of person, and as such must be guided in their use by a basic humanism i.e. what is most appropriate and beneficial to the person. To do otherwise is to dehumanise the person.

The new information technologies bring four elements together : Store information in vast amounts, process that information to logical procedures, display such information in multiple formats and send such information to multiple receivers. Because of these abilities of new technologies, one can conclude that this

technology can perfectly stimulate human thinking. There is, however, a vital difference between what new technologies do when they process, store, send and display information and what human minds do when they think. If these differences are not recognised, they might lead to a tragedy rather than a triumph. The reason for this being that the mind thinks with ideas and not with data. And the development of the thought process of a person is a universal goal of education. Our goal in distance education must be to use new technologies to assist in a human based learning process.

The introduction of new technology into an existing distance education system should not be undertaken, as a result, without due attention to the fact that this will not only change the distance education system, but affect as well, the larger ecological system of which distance education is a component.

Planning for the introduction of new technology in distance education, therefore, should not be restricted to the distance education system or technology itself. It is the entire ecological system which should be thought of in bringing about the changes.

After analysing the system of distance education, now we turn our attention to the present status of distance learning system throughout the world.

Distance Learning Models at University Level

Distance learning method at the university level is very old. In earlier days universities in UK and also in India had no teaching functions, but merely registered and examined students for external degrees. Even university started providing correpondence education facilities to external students. Today, by and large conventional universities while providing teaching in colleges university teaching departments have correspondence tuitions in some faculties. A massive centralised state provision for correspondence education at all levels, including university level is provided in France.

The most recent development is the innovative model of distance learning, using a variety of combination of distance teaching methods to provide specially prepared multi-media courses and with formal responsibility of evaluation and accreditation. The first of this new generation of institutions is Britain's Open University with no formal entry requirements, and the 'openness' of its teaching. During the last ten years, autonomous distance teaching institutions have been established in a number of countries. These institutions include the Free University of Iran, Everyman's University in Israil, Pakistan's Allama Iqbal Open University, the Fernuniversitat in West Germany, the National University for distance education (UNED) in Spain and the universidad Estatal a Distancia (UNED) in Costa Rica, the National Open University in Venezuela (UNA), Athabasca university in Canada, the Radio and Television university of China. The other developed and developing countries in the would like Thailand, Indonesia, Holland, Columbia, Bolivia and others have established open university systems as a major principle in development. In India first open university was established in Andhra Pradesh and other states in the country could start open universities. The National policy on education recognised the importance of open university and distance learning and also the role of media. It says : "The Open university system has been initiated in order to augment opportunities for higher education and as an instrument of democratising education. The Indira Gandhi National Open University established in 1985 in fulfilment of these objectives, will be strengthened. This powerful instrument will have to be developed with care and extended with caution".

There are number of general features common to these institutions: the teaching, assessment and accreditation are integrated, Institutions are committed to distance learners, hence academic staff have no conflicts between internal and external students, and there is a strong motivation to develop and enhance distance teaching methods free from constraints and traditions of face-to-face teaching and are free to devise new educational programmes for new target groups.

Distance Learning Systems

The term 'distance learning system' is used here to indicate projects that attempt to develop the full potential of distance learning models, without relying on traditional educational structures.

(i) Key features of the system concerning students are :

(a) Opening of opportunity for education to new target populations deprived previously because of geographical isolation, lack of formal academic requirements, employment conditions or socio-economic-cultural background.
(b) The identification of particular target groups with their key characteristics—need, age, time available for study, local facilities, etc.—

to enable appropriate courses, learning methods and delivery systems to be devised for them.

(ii) Factors Concerning Learning Material are :

(a) Flexibility in the content and the curriculum of the learning materials through modular structures or credit system.

(b) Formulating learning objectives, self assessment devices and designing learning materials.

(c) Planning use of communication media and other resources suited to the needs of students. This may include correspondence lessons, newspaper supplements, radio and TV broadcasts, audio and video cassettes, films, computer-assisted learning kits, counselling and local tuitions, self help groups of students, lending library facilities and so on.

(iii) General Features of Distance Learning Systems :

(i) Great flexibility in teaching methods and student groups covered as compared to conventional education.

(ii) Production in bulk of learning materials, such as, texts, kits, broadcasts and so on, and system search for and use of existing infrastructure and facilities available in higher education - libraries, broadcasting organisations, space, printers and publishers, etc.

(iii) Lower recurrent unit cost per student than conventional class-room teaching and lower capital cost per student.

The Organisational Structure

The organisation structure for distance learning by and large, is common and is shown in *Figure 1* as developed by Miller & Rice .[9]

Two major operating systems are distinguished in distance learning institutions :

(i) Course subsystem is concerned with design, production, distribution and reception of the teaching materials used by the Institution.

(ii) Student subsystem which admits students, allocating them to courses, local centres, tutors and counsellors, collection of fees and ensuring that they receive teaching material, administering assessment and examination processes, issues certificate to successful students and maintaining students records. This subsystem, is essentially an administrative one involving management and control of students and their progress through the institution.

Decision on Distance Learning

Figure 2 indicates flow chart regarding the minimum consideration that require to be taken into account to establish whether or not a distance learning system be adopted to cope with a given educational need. As the first decision point in this sequence, one has to decide whether existing educational system is meeting the important educational needs of a specific discipline and of the population, if not whether in future such needs will be met by expanding existing provision.

Indicators that the conventional system is inadequate at the post secondary level might include :

(i) Inadequacy of existing provisions to cope with current demands and needs;

(ii) Inadequate provision of non formal and or part time educational opportunities for adults;

(iii) Inaccessibility of existing facilities for large population due to distance, time or cost factors;

(iv) Inappropriateness of existing facilities to the aspirations of large sectors of population or to societal needs : and

(v) Low status and standard of teaching profession.

If above indicators are accepted as failure of the conventional system and decision is taken to adopt distance learning system, issues will have to be considered in respect of target population and courses. First issue will be whether potential students are capable or motivated to learn independently. The criterion relating to target group might include :

large numbers,

distribution over a large area,

heterogeneous composition (age, occupation, etc) ; and

Inability to use conventional provision - reason being employment, distance, cost, age, inadequate formal education, etc.

Second issue regarding courses will be standardisation of learning material is acceptable, and that communication facilities exist or can be devised, for getting materials to students in proper manner. Criterion might include :

Lack of well qualified teachers in sufficient number,

Inadequate funds for expansion of conventional provision and recurring cost of teachers' salary,

Urgent need for training and retraining courses in specific areas, particularly for working adults, and Difficulties faced in modifying the conventional provisions to cater to the needs of specific groups.

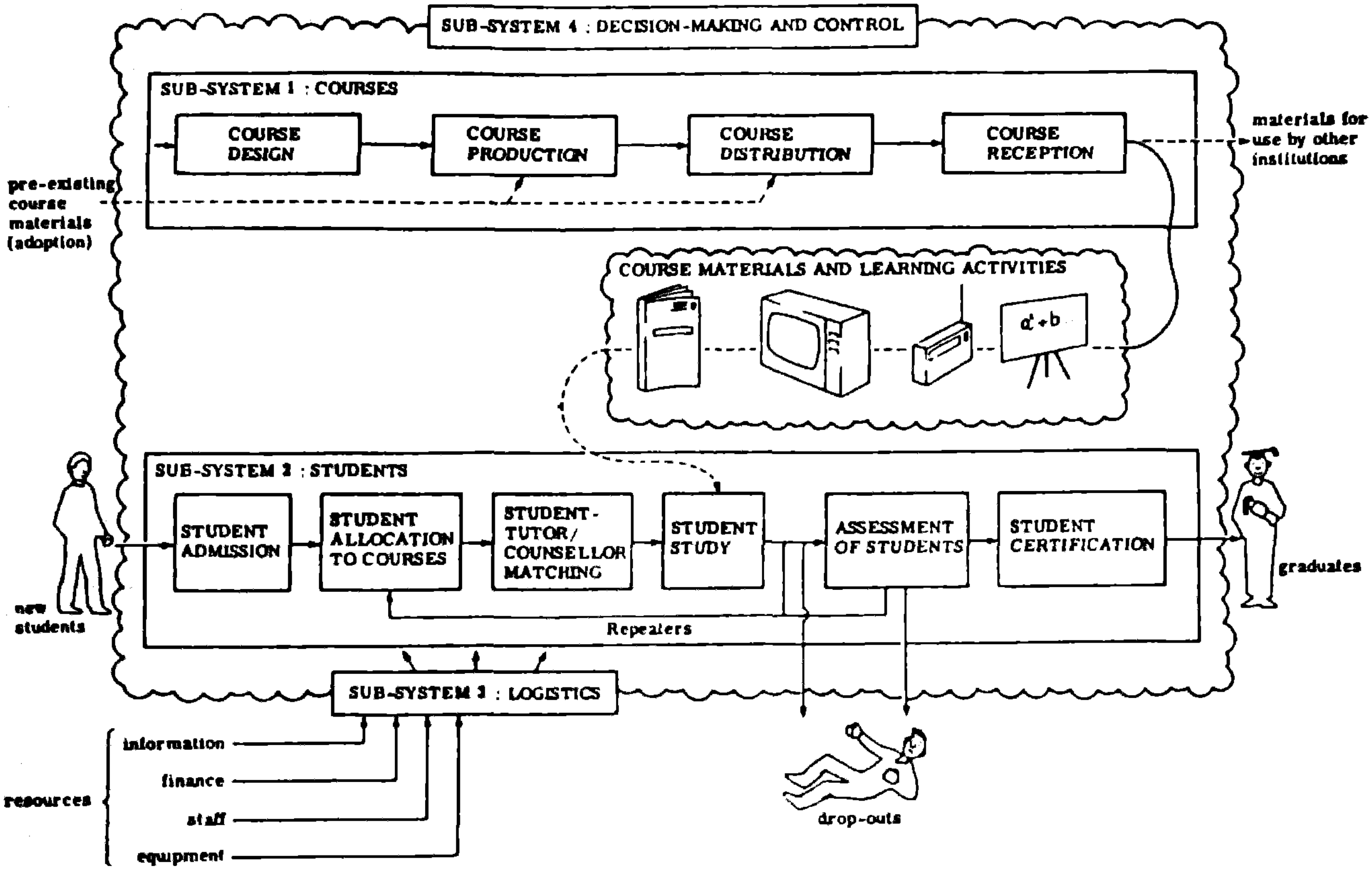

FIGURE 1 A systems view of distance learning.

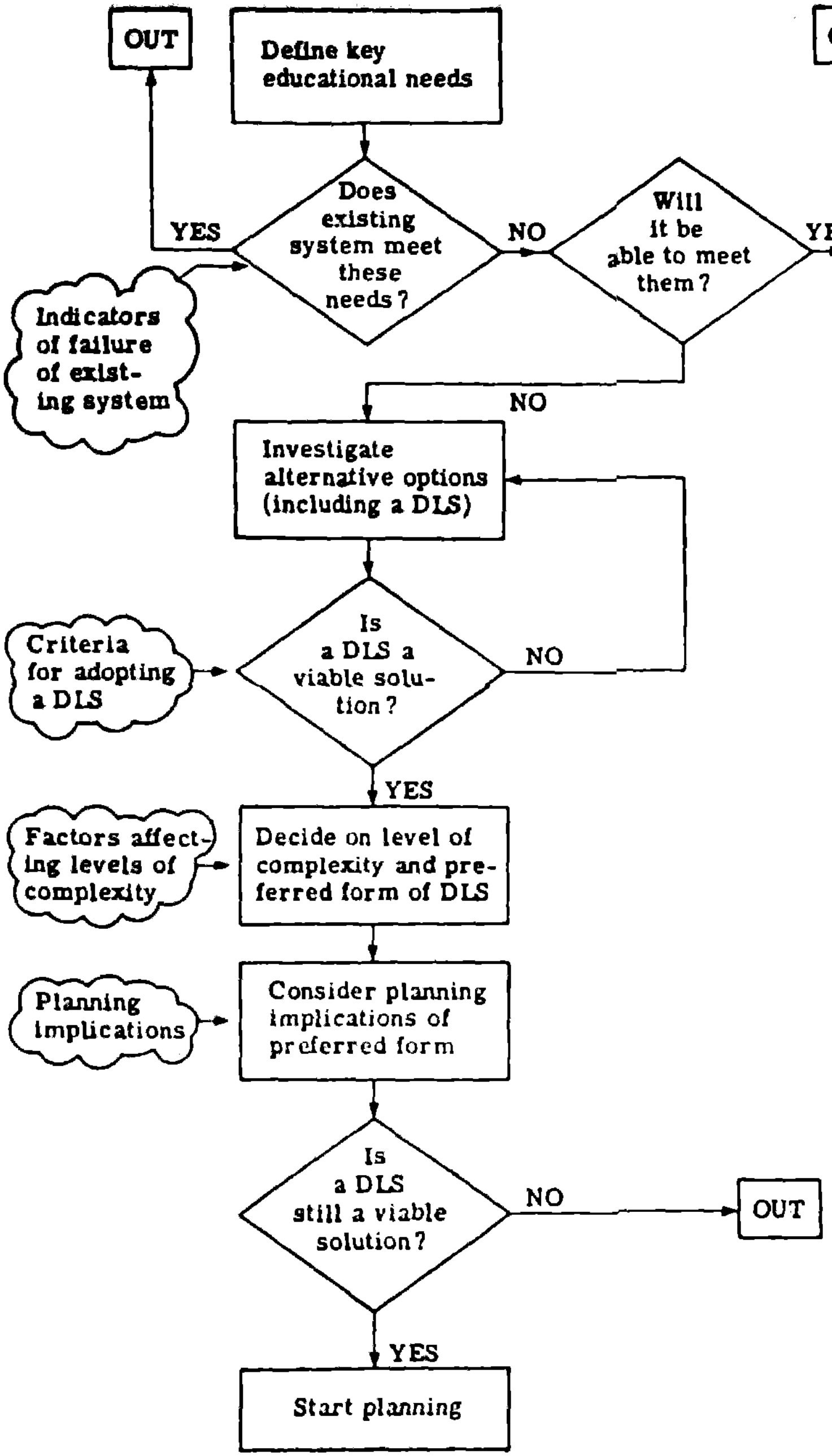

FIGURE 2 Taking a decision on distance learning.

Complexity of the System

What kind of distance learning system ?

After taking a decision on creating a distance learning institution, it is necessary to consider the features which will influence its organisational complexity due to capital and recurrent costs. This can be done with respect to two operating subsystems—Courses and students—identified earlier to find out how they interact with each other to determine the complexity of the whole system.

Table 1. indicates main critical factors in the course and student subsystems, and their implications in terms of cost and complexity for the regulatory and logistical subsystems.[10]

TABLE. 1. *Factors affecting complexity and cost of* Distance Learning Systems.

System	Critical Factors	Implication for
Course subsystem	No. of Courses	Staffing level for preparation and maintenance. Production equipment. Transmission requirements. Storage & distribution.
	Media used (Print) Radio, TV, audio-visual kits, etc.	Special production. Specialist staff. Transmission, distribution, storage.
	Degree of integration of media & components	Preparation time & staffing levels Co-ordination of distribution of different media.
	Quality of course materials (academic, Professional, pedagogical)	Preparation and revision time (Staffing Levels) Quality & Commitment of staff.
Student subsystem	Number of students	Student unit costs/course Distribution of Materials Student records. Examinations & assignments. Tutorial counselling provision.
	Course choice	Students unit costs/course. Number per course prerequisites. Course/student records. Scheduling of examinations.
	Nature of admission requirements	Levels of demands Heterogeneity of student population dropout rates need for support.
	Level & nature of support	Numbers of local centres Numbers of tutors and counsellors. Identification of recipients of special support. Training of tutors/Counsellors.
	Nature of assessment procedures	Recording grades Numbers and distribution of tutors Conduct of examination.

In looking at the course subsystem, design, production, distribution and reception of course materials are the elements that need be considered. If number of courses are more and more sophisticated, the media used, the complexity of the system and capital cost will increase. Use of radio and TV would involve the cost of equipping studios and there by increasing organisational complexity. More costly systems would bring together professionals and experts from widely different fields, thereby increasing organisational complexity of the project.

As far as student subsystem is concerned, the numbers, geographical distribution, heterogenous student group with differing problems and needs would increase complexity of the system. However the system will have to respond to such situations and create special counselling and support schemes. Regular assessment of these students will be another problem which would need careful thinking. Each of the activities has significant cost implications.

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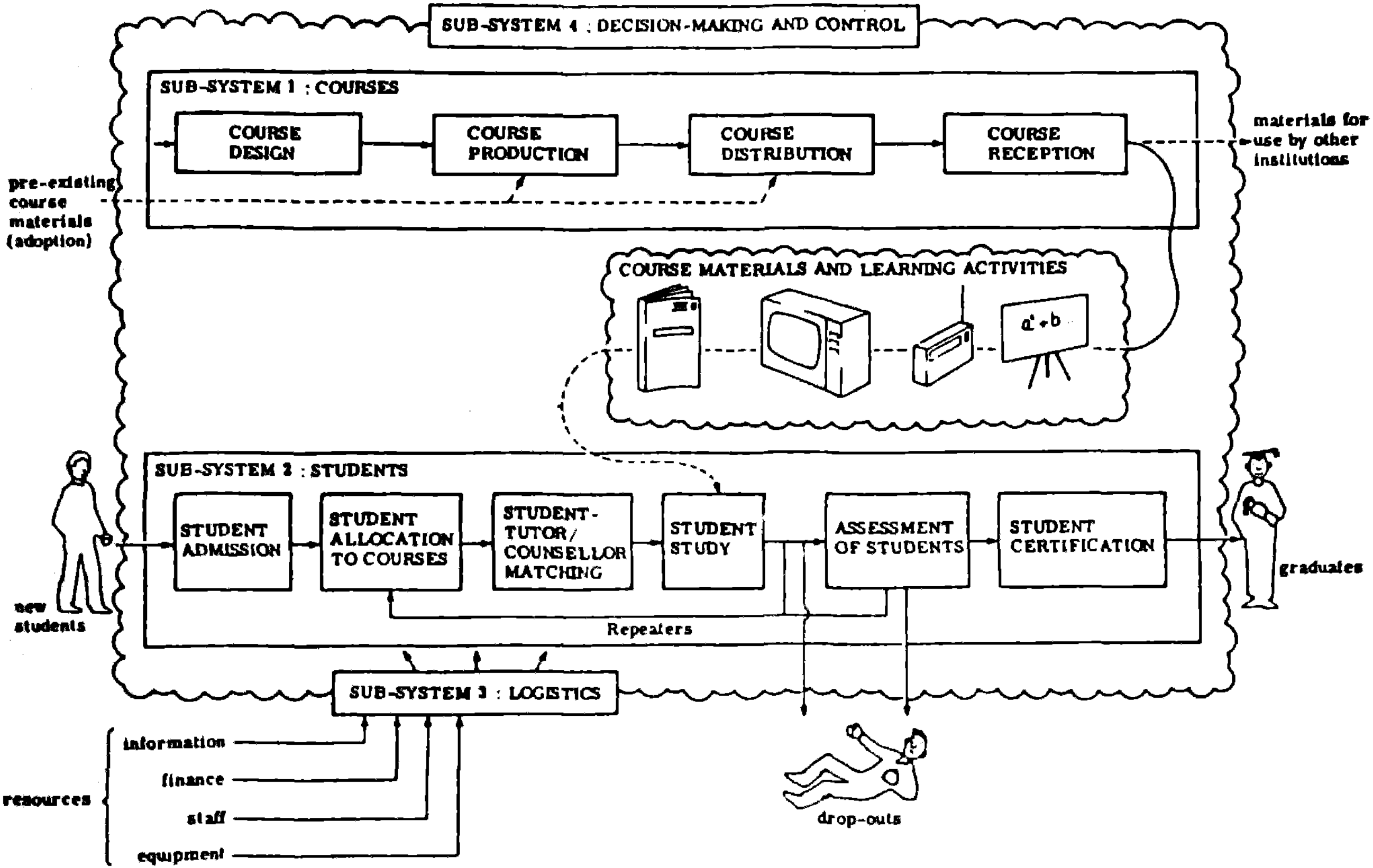

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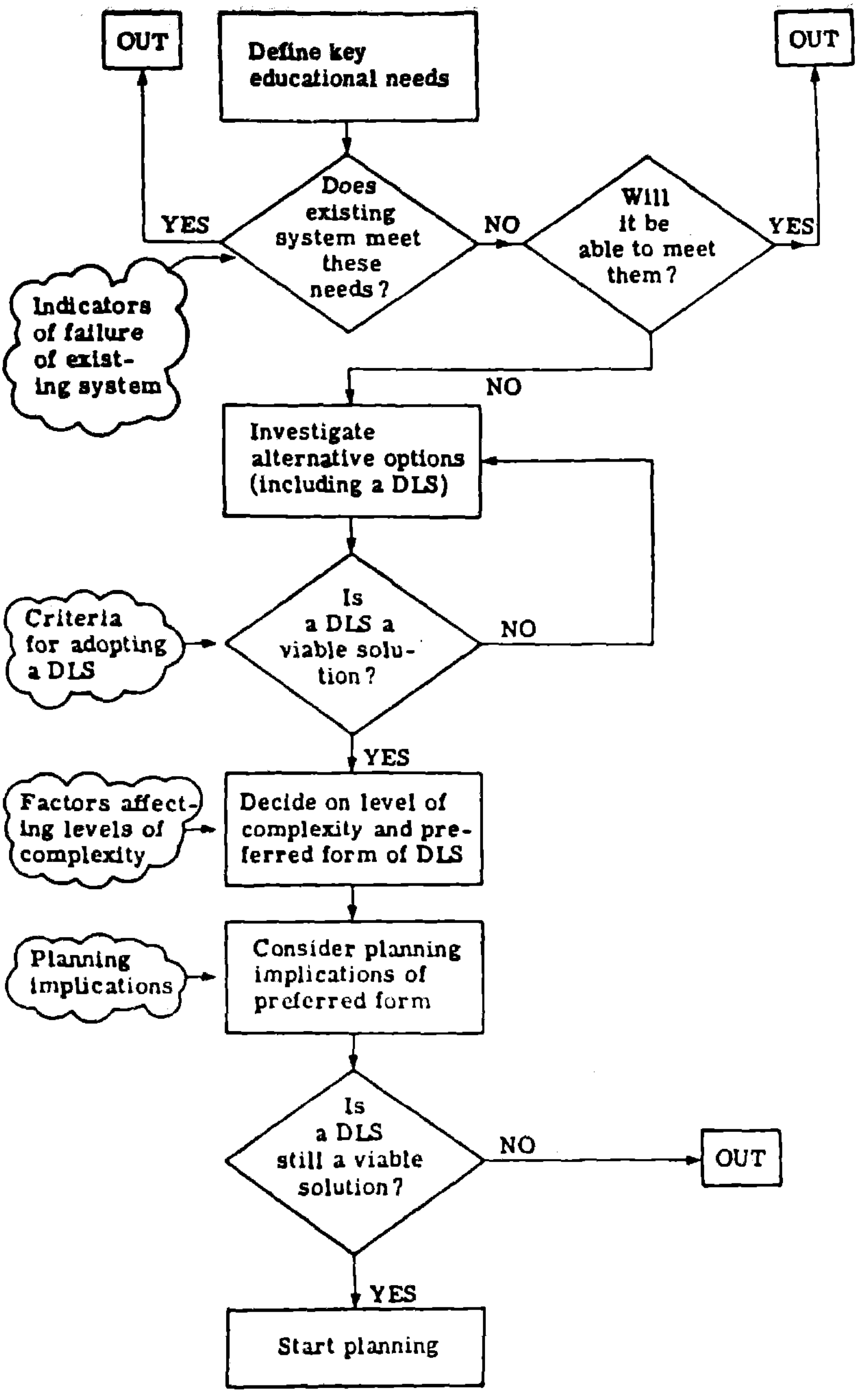

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Comparison with Conventional Methods

Some of the main differences between distance learning and conventional systems are given in Table 2. They can be summarised as :

TABLE No. 2 Comparison of Conventional and Distance Learning Systems.

Dimensions	Conventional system	Distance Learning system
1. Students	Relatively homogeneous (age & qualification)	Heterogeneous
	Same location (Class room)	Scattered at a distance
	Dependent Learners	Independent learners
	Controlled situation	Relatively uncontrolled
2. Students Records	Do not need to be highly developed nor very detailed	Accurate student records essential (addresses, allocation to tutors, assessment grades, correspondence, etc.)
3. Student Support	Built in face to face teaching.	Need for special provision of local counselling services to help students with learning problems so as to minimise drop-outs. To design a proper set up to bridge the gap between students and Central Institute.
4. Student assessment & accreditation.	Problems of reliability & validity are minimal	Assessment at a distance increases problems of validity. Use of large number of tutors decreases reliability.
	Relatively cheat proof	Impersonation and cheating is a potential problem (Credibility)
5. Media/ Methods	Essentially face to face teaching	Essentially Media teaching
	Teaching skills needed fairly well defined.	Media/Method skill needed is generally not available.
	Labour intensive	Capital intensive
6. Courses	Well defined, few, relatively simple.	More complex-course creation
		Production and distribution processes with specialised staff.
	Many options/ courses with few students in each- high cost Initial start up cost-less.	Tendency for few options initial cost—high reduces with increase of students.
7. Organisational set up	Majority of teachers in schools and colleges are available. Little administrative support required.	Strong administrative framework needed to link together student support and record functions, course creation functions, course production and distribution functions. Specialist functions need to be carried outside DLS (e.g. Printing, broadcasting).
8. Control & Regulation	Conventional problems of planning, evaluation, decision making.	These problems are magnified and in certain cases qualitatively different (e.g. multimedia nature, integration of multi media production - distribution and teaching systems imposes production control).
9. Cost structure	Basically labour intensive, related to number of students, unit cost per student per year do not vary significantly with number per course.	Basically capital intensive, related more to course creation and production Unit cost per student/year drop out significantly with increased numbers per year.

Concerning Students

The importance of accurate and accessible student records.

The need for mechanisms of communication between students and staff.

(Continued on page 12)

Towards a Commonwealth of Learning

Report of the Expert Group on Commonwealth Cooperation in Distance Education and Open Learning (The Briggs Report, 1987)

Summary

The Challenge

Communications technology makes possible an expansion of educational opportunities by overcoming barriers of distance and remoteness. It enables learners, no matter how remote, to tap the full richness of Commonwealth educational resources. The recent advances in technology, including satellites and computers alongwith the well tried but changing technologies of print and broadcasting, come at a time when education is facing continued challenges of expanding demand and constricted resources. The convergence between the world wide educational need to extend educational opportunities and the expansion of communication channels through which such needs can be met forms the background to recent developments in distance education on both a national and international scale.

Distance education programmes, in which students study through print, often in the form of correspondence courses, recordings and broadcasts, with limited amounts of face-to-face study, have been used successfully for various purposes within the Commonwealth; for nonformal education, at secondary level, to provide inservice training, and for various kinds of post-secondary education. Evidence on the effectiveness of these programmes indicates that they can be successful and frequently show economies as compared with conventional face-to-face education.

Needs and Opportunities

Distance education has proved of value to individual learners, to employers, to colleges and universities and to government ministries. It makes it possible to widen access to education which has particular value for those remote from an educational institution that can offer the subjects of interest to them. Part-time study made possible through distance education has major advantages both for individuals and for employers by offering education and training without taking students out of the work force. Distance education is of special value to women where their personal circumstances or economic or social pressures make it impossible for them to attend a college or university full-time. As well as widening opportunities for individuals it can be used to address key shortages of manpower. It can help colleges and universities both to reach new audiences and, through the careful use of well prepared teaching material, to widen the range and raise the quality of their teaching on campus.

The same forms of communications technology which make it possible to reach students at a distance within any one country also make possible an international sharing of resources. Students can, in principle, follow a course from an institution outside their own country. Universities can share their teaching through satellites. International cooperation through distance education can supplement conventional forms of student mobility.

In post-secondary education there are educational needs of many kinds which distance education can address, and to which international co-operation is relevant; some are for technical education, some for diplomas and some for degrees. For, while distance education has expanded rapidly over the last quarter century, opportunities to study at a distance remain narrow but could be widened through programmes of Commonwealth co-operation. Through such co-operation the member countries of the Commonwealth can take advantage of distance education's power to cross frontiers and to make the richness of their educational resources available to all. As distance education demands investment in the creation of learning materials there are economic arguments for sharing the costs of this investment between several countries and institutions. The subjects in which the priority needs of individual countries are similar enough for co-operation to make sense, include accountancy and business management, agriculture and rural development, the sciences, teacher education, information technology, technical and vocational training, and English and other international languages.

Technological Opportunities

A battery of different communications technologies can be addressed to the problems of widening access to education and raising its quality. Print,

where recent technical advances have reduced its costs and widened its versatility, remains of key importance. Audio tapes have been widely used to support distance education and have major cost advantages over video technologies. At the same time, the rapid spread of video recorders makes video an important medium for institutions and, in rich countries, for individuals. The use of computer-based technologies, which make possible electronic mail and facilitate access to data bases, have important applications for institutions throughout the world. Universities have begun to demonstrate the potential for satellite communication, especially in regions like the Caribbean and the South Pacific where they offer unique possibilities of regular two-way communication. Common features of the development of communications technology are that costs are falling, and that access to a range of different media is widening. At the same time, the effective use of the available technologies requires specialist knowledge and skills which are scarce, especially in small countries.

Patterns of Co-operation

The promoting co-operation through the use of communications technology, the Commonwealth has five advantages; its membership by both developed and developing countries; its common language; the shared traditions and assumptions of much of its higher education; the richness of the educational resources which it can tap; and the lead which has been taken by Commonwealth countries in developing distance education. Individual Commonwealth countries already have experience of sharing information and sharing resources for distance education within their frontiers. At an international level there is some experience of sharing materials and information and of arrangements that allow students to enrol on courses in a different country. The expansion of co-operative arrangements of these and other kinds rests on this experience; it needs also to take account of the limits of what has been achieved so far, constrained as they have been by scarcity of resources, by a degree of academic scepticism about the process of distance education and by practical difficulties with, for example, copyright and the effective sharing of information.

Experience of existing co-operative programmes, and an examination of Commonwealth needs, suggests that there is scope for Commonwealth co-operation in three broad areas. The first is for materials and course development, whether teaching materials can be shared, or new materials created, to meet widespread and significant educational needs. The second is in supporting individual students by arranging for mutual accreditation procedures for qualifications offered at a distance and by working with Commonwealth distance-teaching institutions in developing their tutorial and support services. The third is in institutional development where colleges and universities teaching at a distance can benefit by sharing in staff training, in the use of communications technology for two-way links for teaching and research, in information and in common programmes of research and evaluation.

To meet these needs effectively calls for a bold Commonwealth initiative which might take one of a number of forms. One possibility is for an information service whose main purpose would be to share information about distance education within the Commonwealth. A second possibility would be a brokerage service which shared information in the same way but went slightly further in fostering co-operative activity between Commonwealth distance teaching institutions. A third option would be an agency with wider functions, able to undertake activities in materials development, in support for students and in institutional development. A fourth is for a Commonwealth Open University which included the functions of the previous options but also enrolled and taught individual students throughout the Commonwealth.

The Proposal

There are powerful arguments for the third of these options : an institution which would work with and through existing Commonwealth colleges and universities but would have powers of initiative and action appropriate to the scale of the educational needs to which it was a response. Its programme would be determined by the key manpower needs to which Commonwealth co-operation can be addressed; courses for external students, to ease success to higher education, to foster student mobility and to support continuing education. It would work with and through existing Commonwealth universities and colleges but not itself seek to enrol students directly. Thus it would provide teaching through a network of existing institutions, enabling them to teach more widely and more effectively, and would appropriately be called the University for the Commonwealth. It would have a programme for acquiring course material from existing colleges and universities and making this widely available throughout the Commonwealth, and a programme for developing new materials,

mainly in co-operation with existing institutions. It would develop a framework for mutual accreditation procedures that would facilitate the sharing of materials, and, by ensuring the acceptability of qualifications, ease student mobility, between Commonwealth countries. Through its programmes of institutional development it would assist both colleges and universities that are already teaching at a distance and those that are embarking on such programmes.

The proposed University would have a small nucleus of staff, building up from about 20 professional and administrative staff to about 60 over a period of five years. It would not itself employ large faculties of academic staff but would arrange for small teams of subject specialists to be recruited, generally on secondment, to work with academic staff members in other institutions. Thus, especially in the development of teaching materials, much of its work would be decentralised. The University would have a small governing body, whose members would serve in a personal capacity, but would be broadly representative of the Commonwealth. The University would need a location with good communications facilities, both for actual movements and for communications links, with an adequate infrastructure of services, where it could be assured of government support and would have easy access to Commonwealth resources. First estimates are that its expenditure would rise from £3 million in the first year to about £9 million in the fifth year; as its services developed so would the possibility of recouping expenditure by charging participating institutions for services. Such changes might be in some cases be met by donor agencies.

The establishment of a University for the Commonwealth on this scale is a bold proposal but one which is necessary if the opportunities presented by advances in communications technology are to be seized for the benefit of learners throughout the Commonwealth, for the benefit of manpower development, for the benefit of Commonwealth colleges and universities, and for the benefit of the Commonwealth itself. Given the appropriate mechanism, the Commonwealth can now share its educational resources in a way that has never before been possible. That is the purpose of this proposal. □

Analysing Distance Learning Systems

(Continued from page 9)

Requirement of local support and tuition facilities to be made available.

Requirement of building, careful procedures into the assessment system if credibility of degrees, diplomas are to be maintained.

Concerning Courses

The need for specialist trained staff to prepared courses, and the availability of existing course materials which can be adopted.

Desirability of starting with a small number of high population courses for economic consideration;

Need for strong but flexible organisational structure to link the academic and operational activities associated with the creation and production of courses. □

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The Great Surge Forward

"The world is not a static place. It is transforming rapidly, particularly as a result of the revolutionary advances in science and technology. These advances have brought about profound transformations in many areas of the material world", said Prof. M.G.K. Menon, Scientific Adviser to Prime Minister and Member, Planning Commission. Prof. Menon was delivering the Convocation Address at the Fortieth Convocation of the Panjab University, Chandigarh. "To ensure that one is an integral part of the great surge forward of human creative activities", he added, "it is important to keep pace with the changing scenario and not be left behind". Excerpts

Convocation

In speaking to those who have taken their degrees and are moving out into the world, to seek employment, to serve society, and most important to use their training and creative abilities to the fullest extent, the first message that I would like to convey is that education has to be a life long process of renewal : of continuing to sharpen ones attitudes and methods of increasing one's understanding, of gaining wisdom and knowledge, to ensure that one is an integral part of the great surge forward of human creative activities in all fields. The world is not a static place. It is transforming rapidly, particularly as a result of the revolutionary advances in science and technology. These advances have brought about profound transformations in many areas of the material world. These have opened up new opportunities as also new challenges, and provided new solutions but also created new problems. To deal with these effectively, it is important to keep pace with changing scenario, and not be left behind.

Nuclear Era

In 1945, the world witnessed a transformation from the age of chemical energy, characterised by electron volts to nuclear energy characterised by million electron volts; this was a transformation by a factor of a million. It is sad that such a revolutionary development was heralded by the dropping of atomic bombs over Hiroshima and Nagasaki in August, 1945. Since then, nuclear arsenals have been built up, on a scale sufficient to destroy the world many times over. We live today in fear of a nuclear holocaust, with the scale of vertical nuclear proliferation that has taken place, and of horizontal proliferation that is coming about. There was great hope that this million-fold increase in energy capabilities would provide unlimited amounts of power which would radically transform the energy availability in developing countries. Nuclear power reactors are a reality: but there have been increasing public fears of safety, hazards of radio-activity and radiation through accidents and miscalculations, of dealing with nuclear wastes, and the cost and time overruns in providing this energy. The net result has been that the impact of nuclear energy on the developing world has far been minimal.

Advances in Space

In 1957, one witnessed humankind's ascent into space with the launching of Sputnik. There have been spectacular achievements in this field since then, with notable events such as planetary exploration using unmanned spacecraft, of men stepping on the Moon, which was witnessed by hundreds of millions of people simultaneously on their TV sets all over the world and more recently of a highly precise rendezvous with Comet Halley. As a result of advances in space technology, the fields of space based telecommunication, radio and television broadcasting, and remote sensing have become every day realities. Intercommunication between human beings all over the world is now no longer based purely on mechanical systems with their characteristic slow speeds and limited density of information e.g. runners, horse and animal drawn vehicles, automotive and railway systems or supersonic jet aircrafts. This interaction today takes place on an easy and inexpensive basis, at the speed at which electrons and electromagnetic waves travel. Whether we deal with telecommunication for voice communication, telex and fascimile systems for written communication, the spoken word through radio, or audio-visual messages through television and video systems, we can say that this now takes place close to the speed of light and with enormously denser information packaging.

Electronics, Telecommunications and Informatics

The opening up of the field of solid state electronics, with the discovery of the transistor in 1947, followed by integrated circuits going upto the very large levels of integration possible today, and geometries of a micron or less, have revolutionised electronics. This has enabled us to reduce weight, volume and power requirements, and to increase speeds, functional capabilities and reliability of electronic systems; as a result, they have now become all-pervasive, entering every facet of human life and endeavour. One now sees the power of digital computation from the smallest of pocket calculators to the large super computers, taking us upto the area of artificial intelligence. Instead of the complex systems languages earlier used, we can now interact with computing systems through commonly used language, indeed with speech inputs, making these systems wholly "user-friendly." These systems are all essentially based on digital logic, with the binary system of just two digits, zero and one. With these new possibilities, opened up by solid state electronics, telecommunications have also become digital; and this has made possible the coming together of computer and telecommunication systems. Increasingly, mechanical and electro-mechanical, as also pneumatic systems, are being replaced by electronic systems. As a result, we now have a complete loop in real time from electronic sensing and measuring, to communication, storage and computation of data, comparison with expectation or prediction, correction through control systems and communications, and then the feedback through the original sensors. It is these developments that have enabled the revolutionary advances in space technology and telecommunications. These capabilities are increasingly making their way into the areas of industry, offices, services, homes, and in a sense into the daily life of each individual. This is the Age of Informatics. From the earlier ages of humankind, characterised by materials of various types, we moved to the age of Industry and Energy, and are now in the Age of Informatics. This is of profound significance for the structuring and functioning of society, the nature of production, employment, services and so on.

New Materials

Through basic understanding in physics and chemistry, it has become possible over recent decades to develop a whole new range of materials, e.g., plastics, polymers, alloys, ceramics, composites and the like, which can be tailored to end-use requirements and economics. One is familiar with the ubiquitous plastics bucket, which can be seen in the remotest of our villages; but remember that this is only four decades old. Capabilities relating to new materials have been fundamental to the developments that have been taking place in the fields of electronics, nuclear energy and space among others. Totally new opportunities are now opening up in the field of ceramics. A spectacular event in this area was the discovery, less than two years ago, in the field of high temperature super-conductors, based on ceramics In time to come, in the field of energy technology, this could be as profound a move forward as caused by the discovery of the transistor and opening up of solid state electronics in 1947. The opportunities arising through materials that can transmit electricity with no resistance, at temperatures which can be dealt with easily, are mind boggling. Electricity generation, transmission, traction, electronic applications and the like will get totally transformed when these developments become truly practical.

Modern Biology

And yet, with all these developments, there are many who would say that what lies ahead is the new Age of Biology, with increasing understanding of life processes, structures and functions at the molecular and cellular levels. The discovery of DNA, the capabilities relating to recombinant DNA technology, work on hybridomas and immunology and in developmental biology have opened up totally new vistas in biomedical sciences, agriculture and industrial production. New areas relating to the human brain and neuro-biology are now being explored. We knew earlier that everything in the universe is built up of basic blocks, the chemical elements. We now know that all life is built up of basic building blocks put together in an order which contains the set of instructions which defines how the ultimate living system would look like and function. We thus see a basic unity in all living matter. These fundamental discoveries of modern biology should be taught to all students, to convey a feeling of how all human beings are the same except for minor changes in the instructions that define build, skin, colour, etc; and indeed how closely we are related to the birds, animals, and plant and animal life in general.

Transportation

On a different plane, one has seen a total change in transportation systems, with the advent of wide-bodied jet aircrafts, moving millions of human beings around the world across national boundaries. Thus, with radio, telecommunication, television, and modern

transport systems, the world has indeed become a small place. We also know that it has become a highly inter-dependent place, with movement of materials, services, goods and people. We thus live in an increasingly inter-dependent world. And everything that I have said for the world will apply to our country, which is a mini world of sub-continental dimensions.

All that I have described has taken place in the last four decades since World War II or Indian Independence. And all of it is directly related to advances in science and technology. There is no other, field of human creative activity in which such rapid revolutionary developments have occurred.

The Limitations

These advances, that have taken place in much less than one human life span, have brought human beings in individual countries, and between countries, so close; and made the world so inter-dependent And yet, how is it that we see so much compartmentalisation, factionalism, and parochialism, based on nationalism, religion, regionalism, language and such other considerations. This is an area for major sociological analysis Perhaps the answer lies in the fact that whilst these advances and transformations are taking place, they are leaving unaffected a very large part of the world, that we refer to as the developing countries; and even within them the fruits of these advances are limited to the upper crust of society. In spite of the great powers of modern science and technology that I have just described, one can see in vast parts of the world, scenarios that have remained unchanged over thousands of years; of life at subsistence levels, of grinding poverty and degradation, of famine, being subject to the vagaries of nature, of static hierarchical societal systems and the like. The advances resulting from science and technology have clearly to be rapidly spread to the grassroots more evenly and with equity.

Pope John Paul II has said (1983) :

"Peace is born not only from the elimination of hotbeds of war. Even if all these latter were eliminated, others would inevitably appear, if injustice and oppression continue to govern the world. The intention to direct science to the promotion of justice and peace demands a great love for humanity. Every human virtue is a form of love. This is the case, in particular, of justice, which is love of neighbour, of individuals, and of peoples. Only the person who loves wants justice for the other person. The person who does not love seeks only to obtain justice for himself."

Impact of Science and Technology on National Development

I must, at this stage, hasten to point out that in the Indian experience, over the past four decades since Independence, there is ample evidence of the application of knowledge and methods based on modern scientific and technological advances, to bring about improvements in the quality of life of our people. I shall only give a few examples.

The population of India in 1901 was 238 million. It increased relatively slowly, at a rate of 0.83% per annum, over the half century 1901-1951, and reached a figure of 361 million in 1951. This slow rate was essentially because of frequently recurring famines with food shortages and malnutrition, and epidemics of various types. However, between 1951 and 1985, the population grew at little over 2% per annum, with indications that in the decade 1971-1981, the rate was as high as 2.25% per annum. This has been largely a result of increased availability of food, and control of diseases. Specifically, life expectancy increased from 32.1 years in 1950-51 to 54.4 years in 1980-81 and is estimated to be 56.5 years in 1984-85; the figures of infant mortality have gone down significantly, though they are still much too high at the average national level infant mortality came down from 124 per thousand live births in 1970 to 104 in 1984; small pox has been eliminated; and there are major programmes for the control of many communicable diseases.

In the area of foodgrain production, from 52 million tonnes in 1951-1952, and 72 million tonnes in 1965-1966, we have reached a figure of over 150 million tonnes in 1985-1986. This was due significantly to the high yielding varieties programme, referred to as the Green Revolution, which had its origins in scientific and technological capabilities in the country in genetics and plant breeding, with the ability to take advantage of new inputs from outside; and evolving of technology packages, including dissemination, extension and technology transfer. As a result, the country has become largely self sufficient in foodgrain production, and been able to meet situations like the severe drought of the past two years.

At the time of Independence, India had a nascent industrial structure, based on individual examples of exemplary entrepreneurs, largely confined to a few textile mills, the steel plant at Jamshedpur, certain basic extrac-

tive sectors and the like Today India produces practically all the items needed for the daily life of its people through industrial production in the country. A substantial base of industry and industrial production has been set up. In recent years, industrial growth has reached a highly satisfactory figure of around 10%. There are many sectors of our industry, for example, electronics, oil and petrochemicals, etc., in which there is major impact of indigenous capabilities in science and technology.

Significant capabilities have been built in science and technology, particularly in areas of nuclear, space, electronics, defence and certain industrial technologies which, if they could be enlarged on a significant scale, will bring about a major transformation. We have many achievements to our credit in these areas. Indeed, if one looks at Indian history in recent times barring those occasions where the nation stood together against external aggression, and applauded our success, such as in the 1971 hostilities with Pakistan, I can recount unqualified applause from all sections of society, and from all of shades of political and other opinion, only in the case of our visible scientific achievements, such as the peaceful nuclear explosion at Pokhran, the launching of Aryabhata or IRS 1, the successful SLV launch, testing of the Prithvi Missile, and so on.

Thus one has evidence of significant changes on the national scene in a macro-sense, as a result of scientific and technical inputs. But in terms of true self-reliance, modernisation and technological upgradation at grassroot level, we have a long way to go. This involves both programmes to propagate the scientific temper, covering objective, rational approaches and attitudes, as well as the development of capabilities and technologies that would directly benefit the individual citizens of our country, particularly in the rural population, and those in the poorest strata of society. This is the transformation that has to be brought about for scientific and technological growth to take off, in terms of true benefits to our society on an equitable basis. This will call for a major effort at human resource development.

Problems, Challenges and Opportunities Concerning the Development of Our Nation

There are several areas of deep concern to me. First, there is the continuing growth of population at a rate of over 2% per annum, which will take us to a total population of approximately one billion by the year 2000. There are the basic needs of this population for water, food, shelter, energy, clothing and employment, and the associated aspects of education and health. We will need to produce 230 to 260 million tonnes of foodgrains to meet the needs of a population of one billion by the year 2000; and this will have to be grown on the net sown area currently in use. There is little scope for growing more food through increase in area under cultivation. We, therefore, have to increase productivity very significantly. Apart from foodgrains, we will need to meet the other needs, of protein through fish, meat, poultry, and pulses, as also of edible oils, vegetables, fruits, etc. All of this will have to be done in the context of the energy scarce economy of the future. We have seen the problems of acute scarcity of water for drinking and for agriculture in the past two years. Drought is not an exception but a known recurrent phenomenon and we will have to learn to live with it. Apart from food security, we will need to ensure water security. We will have to significantly increase the energy availability per capita. Non-renewable fossil fuels such as coal and oil will become scarce. Major efforts are called for in the area of renewable decentralised energies. All of these will call for the most powerful tools that science and technology can provide. This is not just the matter of scientific work in a few elite institutions. Science and technology will have to permeate the total fabric of our society. This will call for development of human resources through education, and concomitant nutrition, public health and, most important, moral leadership. These are the challenges before us I am confident that, as a nation, we have the ability to face these. One often sees a mood of cynicism and pessimism—this can only lead to despair and an inability to face this situation. What we need is confidence, courage, integrity and togetherness.

I would like to briefly refer to the need for education to deal with the problem of value systems, not by superimposition of these but as an intrinsic part of the learning process. Many elements in our value systems are at the very base of our existence as a nation. These are principles of secularism, democracy, non-violence, national integration, tolerance and compassion. It is important that our education system covers these aspects of our values, and the cultures and the roots from which they stem.

National development is not something to be left purely to government. It is the concern of the whole country; the entire community of citizens must be involved in its programmes and committed

to its tenets. Each one of us must recognise our responsibilities to our less fortunate brothers and sisters. The attack on poverty is not just the responsibility of government; it is the responsibility of each one of us. Whether we will awake this understanding in good enough time to be able to transform India is the question that confronts us.

The University Community

Having spoken thus far about the many issues of the rapidly changing world scenario, in particular the science and technology scene, and the problems and challanges facing us nationally, I would like to address myself briefly to aspects that are of direct concern to those constituting the university system: the teachers and the students. Those who have taken their degrees and are coming out in the real world have many hopes and aspirations; one is young and starry-eyed, and hopefully optimistic of the future that is in store. However, the major concern of each one relates to securing gainful employment; and education is seen as a means to improve the chances of securing such employment. But in real life, we are presently faced with the problem of increasing numbers of educated unemployed. I believe the university and the teachers have a special responsibility in this regard to the students. The situation is different from the ancient days of rishis and ashrams. After training in such places, the students went back to pre-determined vocations; this is no longer the case. One is living in a fast moving competitive world. There has to be a match between the education system and its output on the one hand and employment opportunities on the other. The university and its teaching staff must provide career and vocational guidance to their students, and institutionalise a process of continuing interaction with those who can provide employment. Increasing avenues become available to an individual who has been given a wide base of training, rather than if one is confined to narrow spectrum of knowledge for which he or she has been selected to study in classical curricula. There are many new opportunities in inter-disciplinary areas and the universities must create mechanisms to enable students to take up different combinations of subjects and courses. The university system must interact increasingly with those engaged in such endeavours on the national scene.

To the students I would say that they must realise that this country has had a great past. It has had many civilizations and cultures. We should take pride in these roots and have confidence in ourselves. There is often a tendency to only look to the western developed countries and intimate their cultures without truly realising the roots from which they sprang. We should imbibe the discipline, the capabilities for very hard work, the dignity of labour and many other good qualities which also exist there. We must realise that there is no easy way out; success comes to those who preserve, who are committed to hard work and give their best in whatever they take up. John F. Kennedy had once remarked: "Ask not what your country can do for you—ask what you can do for your country".

Srinivasa Ramanujan and C.V. Raman

Over the past year, I have been thinking deeply about two of the greatest men of science that India has producted in recent times: Srinivasa Ramanujan and C.V. Raman. A few months ago on

22nd December, 1987, we celebrated 100 years since the birth of that natural born genius of mathematics, Srinivasa Ramanujan. Later this year in November, we will be celebrating 100 years since the birth of that other genius of Indian Science, C.V. Raman.

What is it that we can learn when we think about these landmark events. In Srinivasa Ramanujan we saw the flowering of a self-inspired and self-taught genius—and who was so deeply motivated from within that in spite of grinding poverty and hardships established himself in the ranks of the greatest mathematicians the world has seen; of such stuff is science truly made. One cannot hope to see such genius quite often. Individuals like Galileo, Newton, Einstein or Ramanujan are seen in time intervals of the order of centuries. But at levels somewhat below these towering peaks there must be many of outstanding merit, particularly in the large population such as ours. There is a responsibility that each one of us carries, to ensure that such genius is recognised, nurtured, and provided with challenges and opportunities to fructify. They may be much greater than any of us, and the least we can do is to give them support and encouragement to flower; rather than a spirit of jealousy or envy. This can come about only through significantly increased programmes for human resource development, by major expansions of our educational activities to cover the bulk of our population, and by special efforts to look out for those who are naturally gifted.

As we celebrate the centenary of Srinivasa Ramanujan, it is an occasion for us for introspection. We have through the centuries produced great men of mathematics like Aryabhata, Bhaskara I & II, Varahamihira, Brahmagupta and many others. There are many in the world who talk about an Indian affinity for mathematics. Studies and research in this field do not cost much, as they involve no large capital items; and yet it is queen of all sciences, the underpinning element for the development of all science and technology. As we engage in this introspection, it is clear that we should find ways and means to recreate the elan for improved growth of mathematics in this country.

Again as we look back on the life and work of that other genius C.V. Raman, there are many lessons that we can learn. We have had, of course, many examples in public life in India of those who left the administration and other professions to join the struggle for freedom C.V. Raman was, however, one who left a secure job future in financial administration, being a member of the Indian Finance Department, to take to science on a full time basis. He did so at the invitation of that great educationist Sir Ashutosh Mukherjee, who recognised the genius of Raman and offered him the newly created Palit Professorship of Calcutta University. Sir Ashutosh then remarked, "I should fail in my duty if I were to restrain myself in my expression of the genuine admiration I feel for the courage and spirit of self sacrifice with which Mr. Raman has decided to exchange a lucrative official appointment with attractive prospects, for a University professorship, which I regret to say, does not carry even liberal emoluments. This one instance encourages me to entertain the hope that there will be lack of Seekers after Truth in the Temple of Knowledge which it is our ambition to erect". This commitment and dedication to science is something that I would like all of you to remember.

Earlier, after his B.A. degree, C.V. Raman had plans to go abroad as suggested by his teachers, but on being examined medically, he was told that his health may not stand the cold and damp climate of England. He later remarked that he was deeply grateful to the British Civil Surgeon whose advice resulted in his staying back in India to develop his own natural genius.

C.V. Raman, I am told, was very fond of a story attributed to the great Lord Rutherford who, when asked by someone, 'Lord Rutherford, you always seem to be riding the crest of a wave', replied, "Damn it, I created the wave, didn't I". Raman felt that that is how it should be—we should create the waves and ride on them and not be also-rans, following the trends, fashions and leads set by others.

Ramanujan and Raman stood for excellence of the highest order. They truly worked at the frontiers of science. And their lives and their work should inspire us to attempt to do likewise. This is a most appropriate occasion in an educational institution and temple of learning, in the year of their birth centenary for all of us to pay tribute to these great sons of India and the inspired message they have left behind for us. □

Super Computer for IIT Kanpur

The ETA 10 Computer system is being installed soon at the Indian Institute of Technology, Kanpur. ETA 10 has the ability to solve very large problems because of its high-speed Scalar and Vector processors, large memories, broad band-widths and extensive input and output capabilities. It can be accessed directly by terminals, micro-computers, workstations and mainframes. Up to 4000 to 5000 workstations can be connected to ETA 10 G system.

The ETA 10 P ordered by IIT, Kanpur has a single processor with a 24 nano second clock and 32 Mb of CPU memory. The configuration includes a service unit with a service processor, an operator console, 64 Mb of shared memory and an input/output unit. High-speed peripherals are also included.

IIT, Kanpur will be utilising this system to cater to both numeric processing loads and interactive loads. Application packages that will run on the system include packages for Engineering disciplines, Physics and Chemistry. The application areas include Computer Aided Engineering (CAE), Robotics, Water Resources Engineering, Transportation Engineering, Finite Element Analysis and Structural Engineering, Large scale Simulation and Optimization, VLSI and Electronic Design, Monsoon Physics, Condensed Matter physics, Quantum and Molecular Chemistry, Metal Alloys Analysis, Expert Systems and Artificial Intelligence.

The system has the capability of both batch and interactive modes of operations. It is the first super to have a fully functional native Unix implementation.

User Instruction Programmes

The National Academy of Agricultural Research Management Hyderabad, proposes to organise a workshop on "User Instruction Programmes and Instructional Systems in Agricultural University and Research Institute Libraries" on September 20-24, 1988. The objective of the workshop is to develop a model curriculum for library user instruction programmes in Indian Agricultural Universities (including the deemed universities) and evolve an effective evaluation pattern.

The topics proposed to be discussed at the workshop are: Planning and evaluation of user instruction programmes; Teaching methods and developing of instructional material, Designing and sequencing of instructions in library user education programmes, Learning principles, instructional types; Component of—Study skills, Learning skills, Bibliographic skills, Communication skills, Information storage skills in library users programmes; Informational Graphics: A visual approach to user education in Agricultural Libraries; Planning and organising of Training Programmes, Seminars, Conferences, Poster Sessions and Exhibitions, Library Publicity and Promotion; Information technologies and CDROM in Agricultural libraries; Organisational and interpersonal Communications; Learning Training kits and production of tape-slide Story in user programmes; and Instructional strategies and production of instructional aids.

The programme will also include group discussions; invited lectures and field visits; followed by tutorials, which will provide an opportunity to update the knowledge and the use of modern teaching techniques in the user programmes.

Summer Undergraduate Research Fellowship

Thapar Institute of Engineering and Technology (TIET), Patiala offers Summer Undergraduate Research Fellowship (SURF) to encourage Research and Development activities in the Institute. Students of Third-year in any branch of Engineering are eligible for this fellowship. The programme spans over a period of 6 to 8 weeks during summer vacations. Projects involving high technology and Research are pursued by students under faculty guidance.

This year over ten students have undertaken various projects. These include : (i) Dynamic Behaviour of Concrete; (ii) A non-destructive Brinell Hardness Test for Reinforced Concrete; (iii) Computer Aided Design of Overhead Tanks; and (iv) Effect of Repeated Heating on the Properties of Bitumen.

In the Electrical Department, three students developed a Microprocessor Based Control of a Biomass Gasifier.

With a view to encourage integration, the issue of computer resources with learning process, the Institute granted a fellowship to three students of Third-year Mechanical for their project on "Computer Simulation of Heat Transfer in Internal Combustion Engines".

The projects undertaken by the students during previous years were asunder : Computer analysis and Design of Flat-stab/Floor system for all buildings; Design of Robotic Work Cell; and Effect of Steel Fibres on Fracture Toughness of Cement Concrete Infiltrated with Sulpher.

Why Ganga Water Does Not Stink ?

Under the Coordinated study of Ganga ecosystem, the scientists of Faculty of Basic Sciences and Humanities, Rajendra Agricultural University, took up a preliminary study on Bacteriophages i.e. these viruses which specifically attack and kill bacteria The phages, as they are commonly known, are very specific and selective for their hosts. This laboratory initially took up work on phages specific to E. coli (Wild type). The phages were found to be present in all samples analysed alongwith host cells. In one case where the water was collected from 100 m towards midstream of the river the phages were present but host cells were not observed indicating that the phages could also remain viable in extra cellular phase of their life cycle but how long is not known.

From the study it is revealed that phages may be one probable reason as to why the water remains unspoiled and does not stink even after years of storage. Similar to coliphages there may be other phages also present. A more detailed study is underway, because mere presence of phages in Ganga water for its long shelf life is an insufficient answer to establish the fact.

Training Course on Drip Irrigation

The Mahatama Phule Agricultural University organised a special training course on 'drip irrigation : its design, operation and maintenance' for the Agricultural Engineers of Maharashtra Agro-Industrial Development Corporation (MAIDC), Bombay. The course content included teaching of various aspects of drip irrigation dealing with engineering, agronomy, soils and society; and field visits and exercises.

Delhi Varsity Choir at Maitree Yaatra

The Union Minister for Sports, Youth Affairs, Women & Child Welfare Smt. Margarate Alva flagged off the second phase of the Maitree Yaatra, organized by the Sea Explorers' Institute, Calcutta and the Indian Navy to commemorate the 41st year of Independence. The journey will cover 2,200 kms in 42 days from Okhala Barrage to the Bay of Bengal.

On this occasion, Delhi University Choir group presented a lively song.

The song especially composed on the theme 'Maitree' by Dr. Krishan Lal of Sanskrit Department, spoke of true friendship which arises from the heart and takes into its embrace each and every one irrespective of caste or creed.

Central Assistance for Anna University

The Department of Electronics, Government of India, have identified Anna University as one of the Training Centres for running the P.G. Programme (M.E. Computer Science and Engineering) under Cross Migration Scheme from August 1988. The intake for the course is 10 comprising sponsored and non-sponsored candidates. The Scheme is initially implemented for a period of three and half years. The Department has provided a sum of Rs. 12.20 lacs to cover the recurring and non-recurring expenditure for running this course.

The University Grants Commission (UGC) have sanctioned a sum of Rs. 54.60 lakhs to the Centre for Water Resources of Anna University for a period of 5 years for strengthening of research facilities in the area of Ground Water Resources and Water Resources Management.

Diploma in Handloom Technology Recognised

The Union Government is reported to have recognised the three-year diploma course in handloom technology awarded by the Indian Institutes of Handloom Technology at Salem, Varanasi and Guwahati with immediate effect. The recognition, on the recommendation of the Chairman, Board of Assessment for Educational Qualifications, would enable the diploma holders to secure employment in the Central Government.

ISM Computer Centre

A new Prime 2450 System is being added at the Indian School of Mines (ISM) Computer Centre With a 4 Megabyte memory and interacting graphic terminals and quite a few other sophisticated hardware components, this will be major facility in computing capability. The system will be networked with IDM-S3250 System. This will upgrade the capacity of the computer centre which will now be manned for 2 shifts operation for the benefit of students and faculty members of the School.

New Master Degree Courses at Anna Varsity

The Anna University, in collaboration with the Institute of Mathematical Science, Madras, proposes to start a new Master's degree programme M.Sc. (by research) in the areas of Mathematics, Theoretical Physics, and Theoretical Computer Science with an intake of 10 from the current academic session.

The University also proposes to start a new M.Phil. programme in Environmental Science under the Faculty of Science and Humanities with an intake of 6 from the current year.

B.Ed. by Correspondence

The Punjabi University, Patiala has decided to start the B.Ed. Course and a Diploma Course in Divinity through correspondence from the current academic session.

News from Agril. Varsities

National Symposium on Plant Diseases

Dr. Sukhdev Singh, Vice-Chancellor, Punjab Agricultural University (PAU) said that plant disease epidemics had not only resulted in large scale foodgrain losses, but had world-wide economic and political repercussions. Dr. Singh was inaugurating a two-day National Symposium on Recent Advances in Epidemiology and Management of Plant Diseases. He observed that effective control measures against plant diseases and pests have more significance in this part of the country where intensive cropping was practised and once a disease breaks out, it would take an epidemic form resulting in great losses. He said that major obstacles in increasing foodgrain production were plant diseases and pests and urged plant pathologists to evolve effective control measures against diseases and pests.

Dr. K.S. Nandpuri, Director of Research of the PAU, who presided, said that disease and pest control management had more importance in vegetables and fruits as they were taken raw. He stressed integrated pest and disease control programmes which could effectively check the spread of diseases and pests. Dr. Nandpuri cautioned that the insecticides should be used with care as they were injurious for human beings.

Sponsored by the Indian Council of Agricultural Research (ICAR), the symposium was attended by more than 100 scientists from all over the country.

Mobile Biogas Plant

The Department of Microbiology, Faculty of Basic Sciences and Humanities, Rajendra Agricultural University, has developed a mobile biogas plant with a feed capacity of only 10 cft. and it can hold 15 cft gas (without pressure). The plant is made up of GI sheet. It can be used for gas production from plant wastes (low lignin) from kitchen gardens as also peelings of vegetables. Once filled it starts gas production after 25-30 days initially but thereafter it becomes a continuous process. In the initial stage about one Kg of cattle dung has to be added as the source of methane producing bacteria. Unlike fixed biogas plants it can work with equal efficiency during winters also when the temperatures are too low for the methane forming bacteria to grow and produce gas, as it can be moved on wheels and placed in sun so that the temperature inside may reach a level of about 30°C.

The mobile biogas plants will, it is hoped, make the facility of biogas, popularly known as Gobar gas, available to people in urban areas also.

News from UGC

INSAT-1B Programme of UGC

Between 1st September to 10th Sept., 1988 the following schedule of telecast on higher education through INSAT-1B under the auspices of the University Grants Commission will be observed. The programme is of one hour duration every day from 12.45 p.m. to 1.45 p.m. (Repeated from 4 p.m. to 5 p.m.) and will be available on the TV Network throughout the country. For the viewers in Delhi and surrounding areas these programmes can be seen on the second channel.

1.9.88

"Computer Memory—I"
"Marine M icro Zoo Plankton"

2.9.88

"Modelling Drug Therapy"
"Timekeepers of Centuries—I"
"Weather"

3.9.88

"Design and Environment—V Our Visual Environment"
"Historical Linguistics—Language Families in India"
"Rhythm Puppet Making"

4 9.88

No Telecast

5.9.88

"Enzyme Structure by Spectroscopy"
"Time Management : The Edge of Success"
"Raw Materials—Vegetable Oil"

6.9.88

"Teleteach—XIII"
"Discovery of Vitamins"
"Prevention of Goitre"

7.9.88

"Plants : Problems with Water"
"Transistor as an Amplifier"
"Between Yesterday & Tomorrow"

8.9.88

"Memories—II"
"Crocodiles : The Living Dinosaurs"
"A Vision of Tomorrow"

9.9.88

"Modelling Surveys"
"Timekeepers of Centuries—II"
"Animal in Focus—Saige Antelope—I"

10.9.88

"Design & Environment—VI Forms to Aid Human Posture"
"Dravidian Population Overseas—The Process of Language Attrition"

Sports News

Delhi University Bags Dr. Gupta Trophy

Delhi university has won the prestigious Dr. B.L. Gupta Inter-University General Championship Trophy for the year 1987-88. The Trophy, instituted by AIU in the year 1982-83 in memory of Dr. B.L. Gupta, is in recognition of his contribution to the promotion of sports in the university sector as the Director and Head of the Department of Physical Education, Panjab University, Chandigarh. The trophy is a token of overall supremacy of a university in the Inter-University Tournaments.

The trophy was awarded to Delhi University by Prof. S.K. Agrawala, Secretary of the Association of Indian Universities at the AIU House, New Delhi on August 16, 1988.

Since the inception of this trophy, Guru Nanak Dev University won it for 4 years in succession from 1983-84 to 1986-87. Kerala University were the first winners in 1982-83.

News from Abroad

Revamping Australian Higher Education

Mr. John Dawkins, Australia's Minister for Employment. Education and Training recently released a white paper on higher education which, inter-alia, promises the biggest shake-up of the higher education system ever proposed. It will lead to fewer and larger institutions, a new unified national system, the abolition of the binary system, a huge increase in student enrolments and greater access to those groups traditionally denied a place in higher education.

Mr. Dawkins said the paper proposed the most far-reaching reform of the higher education system to be undertaken. It would lead to a distinctive Australian system that would rank with any in the world.

The policy establishes for the first time a system of direct negotiations between institutions and the federal education ministry over funding for teaching and research. This is, in fact, the key to the government's plans for a radical overhaul of the way universities and colleges are run and the manner in which they are funded. The policy ends what had become an increasingly artificial distinction between universities and colleges of Advanced Education by allowing the colleges to compete with the universities for research funds.

From next year, institutions will receive one operating grant, instead of the several they get at present, for equipment, minor works, recurrent costs and special research. Most of the grant will be determined by a document called the institution's "education profile". Prepared by the institution itself, then negotiated with the government, the profile will define the institution's role and the basis on which it will receive government grants.

The White Paper says the profiles will cover six areas :

(i) The institution's broad mission and objectives
(ii) Details of its teaching activities for the 1989-91 funding triennium, including student numbers, new students and graduating students.
(iii) A research activities outline and research management plans.
(iv) A statement of intent on measures to achieve national objectives, including equity

(v) Deails of other significant activities.

(vi) Approved funding levels.

Apart from the money allocated on the basis of these profiles, the government will set aside 1 per cent of total operating grants in a reserve or "reward" fund for institutions that best respond to identified areas of national priority, such as improving equity.

The White Paper proposes an expansion in graduate numbers from the 88,000 or so at present to 125,000 by the year 2000. Extra student places in institutions should be allocated to such areas as computer science, information technology, business administration, economics, accountancy and Asian studies. The government will also tie general funding directly to each institution's success in enrolling disadvantaged students and will give extra grants to specific equity programmes.

At least a third of the nation's 65 tertiary institutions will be forced to amalgamate with others to meet the government's minimum enrolment figure of 2,000 students. Optimum enrolments will be set between 5,000 and 8,000 students. But Mr Dawkins said there would be no forced mergers. He said smaller institutions would have the option of pushing for more students to raise them above the 2,000 threshold, consolidating with other institutions, or seeking entry to the Tertiary and Further Education system which is funded by state governments.

Institutions with between 2,000 and 5,000 full-time students and little prospect of growth would be encouraged to consider their future as independent institutions. They would not be able to support both teaching and research in a wide range of areas, the White Paper states.

Blueprint for Over Regulation

However, reacting to the government's proposal the Vice-Chancellor of Melbourne University, Professor David Penington, warned that centralization of funding could be disastrous for research. He said no central authority should be given the degree of authority proposed.

Professor Brian Wilson, Head of Queensland University and Chairman of the Australian Vice-Chancellors' Committee, a body which had previously endorsed the government's push for fewer and bigger institutions, said the promise of deregulation had not been delivered. He described the White Paper as a blueprint for over regulation.

He said that the paper in fact represented a major intrusion into the universities' affairs and the government's plans for greater centralization included: (i) Barring institutions from joining the unified national system unless they met demands on internal management; (ii) Using education profiles to make funding decisions rather than allowing people on the ground to make those decisions; and (iii) Interference in the operations of universities by federal government-sponsored reviews of management.

AIU Library & Documentation Services

One of the important functions of the Association of Indian Universities is to act as a clearing house of information on higher education in the country. Towards this end the AIU Library is engaged in collection building and developing instruments for the dissemination of research information. Over the years a valuable collection of books and documents on different aspects of higher education has been acquired

The Library has also developed Bibliography of Doctoral Dissertation as an effective tool in the dissemination of research information. Retrospective bibliographies covering the period 1857-1970 and 1970-75 were the first to appear. Effective 1975, however, the bibliography is issued annually in two volumes. One volume deals with Natural and Applied Sciences while the other records doctoral degrees awarded in Social Sciences and the Humanities. In addition to the normal bibliographical details like the name of the Research Scholar, the title of the thesis, years of registration for and award of the degree, and the name of the University accepting the thesis for award of a doctoral degree, the bibliography also gives name and complete address of the supervising teacher and an availability note that seeks to inform whether a copy of the dissertation is available for consultation and use in the University Library/Department or Registrar's Office.

The columns 'Theses of the Month' and 'Research in Progress' are intended to cut out the time lag between the receipt of information and its inclusion in bibliography. Such Universities as are not sending us regular information in respect of Doctoral Theses accepted and research scholars enrolled are welcome to make use of these columns.

The Library is open from 9.00 a.m. to 5.30 p.m. Monday through Friday

RESEARCH IN PROGRESS

A List of Research Scholars Registered for Doctoral Degrees of Indian Universities

PHYSICAL SCIENCES

Statistics

1. Thomas, P. Yageen. *Estimation of the parameters of location scale family of distribution by order statistics.* Kerala. Dr. Jacob Sundara Raja, Reader, Department of Statistics, University of Kerala, Kariavattom.

Chemistry

1. Birdi, Dilip. *Coordination chemistry of sulfur monoxide, thiazate, disulphido –thionitrate and carbonyl sulphide.* Devi Ahilya. Dr. K.K. Pandey, Reader, School of Chemistry, Vigyan Bhawan, Khandwa Road, Indore.

2. Biswas S.S. *Studies in chromatography.* Shivaji. Dr. N.R. Ayyangar, Head, Division of Organic Chemistry II, National Chemical Laboratory, Pune.

3. Hote, Bhabani Prasad. *Electro-chemical and spectro-electro-chemical studies.* Delhi. Dr. (Mrs) Y. Monika.

4. Wadkar, J.G. *Synthesis of biologically active compounds : Synthesis of benzioxazole derivatives.* Shivaji. Dr. S.N. Kulkarni, Scientist, Organic II Division, National Chemical Laboratory, Pune.

Earth Sciences

1. Ajayakumar, V. *Variation of depositional and diagenetic fabrics of the Jurassic carbonate lithofacies (Jaisalmer limestone), Jaisalmer basin, India.* Kerala. Dr. K.P. Thrivikramji, Reader, Department of Geology, University of Kerala, Kariavattom.

2. Banerjee, Rajeeb. *Structural geology.* Delhi. Prof. P.S. Saklani, Department of Geology, University of Delhi, Delhi.

3. Mahapatra, Ajit Kumar. *Micropalaeontology.* Delhi. Dr. V. Sharma, Department of Geology, University of Delhi, Delhi.

4. Nasseri-Behrestaghi, Mohammad Hossein. *Structural geology.* Delhi. Prof. P.S. Saklani, Department of Geology, University of Delhi, Delhi.

5. Shrestha, Jagadiswar Nath. *Sedimentology stratigraphy.* Delhi. Dr. P.K. Verma, Department of Geology, University of Delhi, Delhi.

Engineering & Technology

1. Gupta, Alok Kumar. *Pore formation in metals and alloys.* BHU. Prof. S.L. Malhotra, Department of Metallurgical Engineering, Banaras Hindu University, Varanasi.

BIOLOGICAL SCIENCES

Microbiology

1. Sharma, Nivedita. *Role of cellulolytic microbes in the degradation of physico-chemically treated forest biomass.* HP. Dr. T.C. Bhalla, Department of Biosciences, Himachal Pradesh University, Shimla.

Botany

1. Kalsi, Gurpreet. *Studies of plant lectins and their role in microbe-plant interactions.* Delhi. Dr. C.R. Babu, Department of Botany, University of Delhi, Delhi and Dr. R.H. Das, Council for Scientific and Industrial Research, New Delhi.

2. Malik, Pushpa. *Aerobiological and biochemical studies on some pollen of allergenic significance.* Delhi. Dr. C.R. Babu, Department of Botany, University of Delhi, Delhi, Dr. A.B. Singh, Council for Scientific and Industrial Research, New Delhi and Dr. S.V. Gangal, Council for Scientific and Industrial Research, New Delhi.

3. Om Prakash. *Specific gravity and tracheid length variations in West Himalayan spruce, Picea smithiana (Wall) Beiss.* HP. Dr. M.K. Seth, Department of Biosciences, Himachal Pradesh University, Shimla.

4. Shad, Onkar Singh. *Biological studies on Moreella species (Morels) of Himachal Himalayas.* HP. Dr. T.N. Lakhanpal, Department of Biosciences, Himachal Pradesh University, Shimla.

5. Sharma, Bindu. *Morphology, physico-chemical properties and cultivation aspects of 'Cauliflower' mushroom, Sparassis Spp.* HP. Dr. T.N. Lakhanpal, Department of Biosciences, Himachal Pradesh University, Shimla.

6. Vaneeta. *Seed physiology and biochemistry mechanism of seed deterioration during storage.* Delhi. Prof. R.N. Chopra, Department of Botany, University of Delhi, Delhi and Dr. P.K. Agarwal, Indian Agricultural Research Institute, New Delhi.

Zoology

1. Hari Prakash. *Biological control in insect pest management.* Delhi. Prof. S.S. Sehgal, Department of Zoology, University of Delhi, Delhi.

2. Kamra, Komal. *Cortical morphogenesis in hypotrichons ciliates.* Delhi. Dr. G.R. Sapra, Department of Zoology, University of Delhi, Delhi.

THESES OF THE MONTH

A List of Doctoral Theses accepted by Indian Universities.

PHYSICAL SCIENCES

Mathematics

1. Antherjanam, N. Nirmala. *Studies on korteweg-de vries equations.* CUST. Dr. M. Jathavedan, Lecturer, Department of Mathematics and Statistics, Cochin University of Science and Technology, Cochin.

2. Arjan Dev. *On some flow-shop scheduling problems.* Meerut. Dr. P.L. Maggu, Department of Mathematics, Institute of Management Technology, Ghaziabad.

3. Das, Braja Kishore. *A brief study of roots of a class of random polynomial.* Sambalpur. Dr. N.N. Nayak, Reader, Department of Mathematics, Orissa University of Agriculture and Technology, Bhubaneswar.

4. Paul, Akhil Chandra. *Distributional boundary values of functions Holomorphic in tubular radial domains.* BHU. Dr. R.S. Pathak, Reader, Department of Mathematics, Banaras Hindu University, Varanasi.

5. Shyam Narain. *Certain contributions to the study of summability of infinite series.* BHU. Dr. L.M. Tripathi, Reader, Department of Mathematics, Banaras Hindu University, Varanasi.

6. Singh, Brij Bhan. *On laminar boundary layers of incompressible flows.* BHU. Prof. K. Lal.

7. Singh, Lal Pratap. *Some aspects of nonlinear waves in radiating and electrically conducting glass.* BHU. Dr. V.D. Sharma.

Statistics

1. Gupta, Subhash Chand. *Some contributions to branching and allied processes.* HAU.

Physics

1. Bajpai, Rakesh. *Study of some mechanical properties of polycarbonates.* Durgawati. Dr. S.C. Datta, Prof. and Head, and Dr. J.M. Koller, Lecturer, Department of Physics, Rani Durgawati Vishwavidyalaya, Jabalpur.

2. Das, Salil Kumar. *Electrostatic and electromagnetic instabilities in plasmas.* IIT, Delhi. Prof. M.S. Sodha and Prof. D.P. Tewari, Department of Physics, Indian Institute of Technology, New Delhi.

3. Gera, Vivan Bala. *Electronic structure of III-V ternary and quaternary alloys.* IIT, Delhi. Prof. S.C. Abbi and Prof. K.P. Jain, Department of Physics, Indian Institute of Technology, New Delhi.

4. Manickkavachagam, R. *Studies in crystal structure analysis : Crystal structures of metallic sulphamates.* Madurai.

5. Mehta, Devinder. *Nuclear spectroscopic studies in certain nuclei.* Panjab.

6. Mukul Kumar. *On heating of the solar corona.* Meerut. Dr. Udit Narayan, Department of Physics, Meerut. College, Meerut.

7. Mulchandani, Anchal Mahesh. *Some aspects of colour centres and related phenomena in microcrystalline powders of alkali halides.* Nagpur. Dr. B.T. Deshmukh, Department of Physics, Nagpur University, Nagpur.

8. Nageswara Rao, Manne. *Some studies on equatorial spread-F using HF and VHF techniques.* Andhra.

9. Naik, Satchidananda. ***Relativistic effects on hadronic structure.*** Utkal.

10. Ram, Shakal Narain. ***Hadronic properties of bottom particles, Gluonia and glue-balls.*** BHU. Dr. C.P. Singh, Reader, Department of Physics, Banaras Hindu University, Varanasi.

11. Reghunath, A.T. ***Studies on optical attenuation in ocn water using dye laser and laser propagation in a turbulent medium.*** CUST. Dr. V.P.N. Nampoori, Reader, Department of Physics, Cochin University of Science and Technology, Cochin.

12. Sarkar, Prasanta Kumar. ***Collision frequency in F-region of the ionosphere.*** Calcutta.

13. Sharma, Ashok Kumar. ***Investigations on frequency stabilization of quarts crystals and associated instrumentation.*** Meerut. Dr. A.S. Yadav, Department of Physics, MMH College, Ghaziabad and Dr. Ram Prashad Emeritus Scientist, National Physical Laboratory, New Delhi.

14. Singh, Kangujam Yugindro. ***Some aspects of hadronemulsion interactions at accelerator and cosmic ray energies.*** Delhi.

15. Subrahmanyeswara Rao, Siram. ***Experimental investigations in the decay of 124 Sb, 115m Cd, 110m 9Ag, and 153 Gd. nuclei using high resolution detectors.*** Andhra.

16. Tiwari, Ram Prit. ***Spectral studies of some substituted benzenes : Sys. trichloro, tribromo and trifluorobenzenes o-difluorobenzene, o-bromofluoro-benzene toluene h_8, toluene d_8, benzene d_6.*** BHU. Prof. K.N. Upadhyaya, Reader, Department of Physics, Banaras Hindu University, Varanasi.

17. Tyagi, Udai Prakash, ***Polytypism in melt and solution grown doped single crystals of cadmium iodide.*** Delhi.

18. Venkoji Pathangi. ***Vibrational and electronic spectra of certain substituted benzaldehydes.*** Andhra.

19. Verma, Rajendra Prasad. ***Annealing and radiation damage studies in some metals and alloys.*** Devi Ahilya.

Chemistry

1. Adeyemi, Olufemi Olalekan. ***Studies on the effect of some organic heterocycles on the acid corrosion of commercial copper.*** Delhi.

2. Agrawal, Om Prakash. ***Some Physico-chemical studies on calcium, barium, copper and zinc containing mixed hydroxylaparites.*** Sambalpur. Dr. P.N. Patel, Lecturer, Department of Chemistry, G.M. College, Sambalpur.

3. Bhat, J. Ishwara. ***Kinetic and mechanistic investigations with positive halogens in the liquid phase.*** Mangalore. Dr. B. Thimme Gowda, Reader, Department of Chemistry, Mangalore University, Mangalore.

4. Dany, Chandra Mohan. ***Studies on some copper and nickel complexes.*** Sambalpur. Dr. Asoke Kumar Das, Principal, Bonaigarh College, Bonaigarh, Distt Sundargarh.

5. Das, Alak Kumar. ***Charge transfer interaction in crystalline molecular complexes.*** Calcutta.

6. Das, Asim Kumar. ***Kinetics and mechanism of ligand substitution reactions at copper II, nickel II and palladium II centres.*** Calcutta.

7. Das Gupta, Debasis. ***Studies on the transport properties of tetraalkylammonium salts in 2-methoxy ethanol, 1, 2—dimethoxy ethane and their aqueous binary mixtures.*** NBU.

8. Dhar, Hemendra Chandra. ***Reaction mechanism of substitution reactions in diamino bis biguanide and diaguo bis ethylene-diamine cobalt (III) complexes.*** Burdwan. Prof. Sushil Kr Siddhanta, Prof. (Retd.), Department of Chemistry, University of Burdwan, Burdwan.

9. Fakhir, Thawra M. ***Isolation and structural studies of seneeio, lupinus and norsecurinine alkaloids.*** Delhi.

10. Gour, Ramdhan Shankarlal. ***Physico-kinetic studies of some drugs in relation to their biological activity.*** Devi Ahilya.

11. Guha, Jayasri. ***Studies in the synthesis of polycyclic compounds by rearrangement of spinanes and acylation by lactines.*** Calcutta.

12. Gupta, Vibha. ***Studies on complexing behaviour of oxygen, nitrogen and sulphur donar molecules with heavy metal ions.*** Meerut. Dr. S.K. Sangal, Department of Chemistry, Meerut College, Meerut.

13. Islam, Nasbreen S. ***Studies on peroxo and heteroligand peroxo complexes of vanadium (V) and fluoro and mixed ligand-fluoro complexes of iron (III).*** NEHU. Dr. M.K. Choudhury, Reader, Department of Chemistry, North Eastern Hill University, Shillong.

14. Jain, Archana. ***Studies in some CH-active heterocycles.*** BHU. Dr. A.K. Mukherjee, Reader, Department of Chemistry, Banaras Hindu University, Varanasi.

15. Jain, Raj Kumari. ***Ultrasonic and thermo-dynamic studies of liquids and solutions.*** Meerut. Dr. M.C. Jain, Reader and Head, Department of Chemistry, S.D. College, Muzaffarnagar and Dr. J.D. Pandey, Reader, Department of Chemistry, Allahabad University, Allahabad.

16. Khan, Iftikhar Ali. ***IPSO-Nitration in some alkoxy benzenes.*** Meerut. Dr. A.K. Manglik, Lecturer, Department of Chemistry, Meerut College, Meerut.

17. Koteswar Rao, Y. ***Synthetic studies towards ( ) — laurenene and some reactions of geminal disulfones.*** Hyderabad. Dr. M. Nagarajan.

18. Majee, Swapan. ***Studies on some chelating ion-exchangers containing 1 : 3 diketogrouping.*** Burdwan. Prof. Jyotirmoy Das, Department of Chemistry, University of Burdwan, Burdwan.

19. Malathi, N. ***Synthesis of the pheromone of the fall armyworm moth z-9-tetradeeenyl acetate and some long chain amines, their quaternary salts from oleuritic acid.*** Delhi.

20. Mukhopadhyay, Sankardeb. ***Synthetic studies in cancer chemotherapy : Synthetic studies with 4 {N, N-Bis- (2-hydroxyethyl) amino} benzaldehyde.*** Calcutta.

21. Nandi, Gopa. ***Studies on natural products and related six membered heterocycles.*** Calcutta.

22. Narayana, C. *Synthetic and mechanistic studies on the hydroboration of olefins with various borane Lewis base complexes.* Hyderabad. Dr. M. Pariasamy.

23. Narender, G. *Study of phenomena of interaction among resin, solvent and pigments and the properties of their dispersions and coatings.* Osmania.

24. Narindra Kumar. *Physico-chemical and synthetic studies of some substituted thiocarbamides and their metal complexes.* Meerut. Dr. V.P. Kudesia, Department of Chemistry, DN College, Meerut and Dr. A.D. Taneja, Department of Chemistry and Biochemistry, Haryana Agricultural University, Hisar.

25. Neelavani, R. *Physico-chemical studies of polymers poly, 2-methoxy cynurate of bisphenol A and C and solution thermal, mechanical and morphological properties.* Patel. Dr. K.C. Patel, Vice-Chancellor, Sardar Patel University, Vallabh Vidyanagar.

26. Ray, Manoj Kumar. *Chemical studies of some medicinal plants with special reference to asteraceae.* Calcutta.

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29. Sharma, Mayank. *Polarographic and other physicochemical studies on substituted thioureas.* Meerut. Dr. J.S. Tyagi, Department of Chemistry, Meerut College, Meerut.

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33. Tyagi, Youva Raj. *Studies on thymidine kinase.* Meerut. Dr. J.S. Tyagi, Department of Chemistry, Meerut College, Meerut.

34. Vansadia, R.N. *Studies on some compounds of medicinal interest.* Saurashtra. Dr. (Mrs) H.H. Parekh, Reader, Department of Chemistry, Saurashtra University, Rajkot.

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1. Jain, Atul Kumar. *Climate sensitivity studies with radiative-convective models.* IIT, Delhi. Dr. Murari Lal, Centre for Atmospheric Sciences, Indian Institute of Technology, New Delhi.

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3. Sanjeeva Rao, Popuri. *Some agro climatological studies of Prakasam and Nellore Districs, A.P., India.* Andhra.

4. Singh, Yamuna. *Geology and gronnd water resources of the South Western region of Rewa Distriet, Madhya Pradesh, India.* Nagpur. Dr. K. Suryanarayana and Dr. G.G. Deshpande, Department of Geology, Nagpur University, Nagpur.

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6. Umamaheswara Rao, Jampani. *Mineralogy and geochemistry of basie pyroxene granulites from Visakhapatnam Region, Audhra Pradesh.* Andhra.

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2. Devaswithin, A. *Comminution studies in Ball Mill.* IIT Delhi. Dr. B. Pitchumani, Department of Chemical Engineering, Indian Institute of Technology, New Delhi.

3. Krishnasamy, K.V. *Regional modelling of nonlinear flows in multiliguifer systems,* Anna.

4. Lyall, Mohinder Singh. *Studies in gas-solid systems.* IIT, Delhi.

5. Prem Prakash, V. *Some aspects of piecewise linear resistive networks.* IIT Delhi. Dr. V.C. Prasad, Department of Electrical Engineering, Indian Institute of Technology, New Delhi.

6. Shrivastav, Kailash Nath. *Studies on the nucleate boiling characteristies of binary mixtures.* BHU. Dr. S.N. Gupta, Department of Mechanical Engineering, Banaras Hindu University, Varanasi.

7. Singh, Brajeshwar. *Physico-mechanical characterisation of particle dispersed, fibre reinforeed, hybrid composites.* BHU. Dr. R.K. Sinha.

8. Singh, Nagendra Prasad. *On feedback control design of singularly perturbed systems with applieations to synchronous machines.* IIT Delhi. Prof. S.I. Ahson and Dr. Y. P. Singh, Department of Electrical Engineering, Indian Institute of Technology, New Delhi.

9. Sinha, Mahesh Prasad. *A study on slow wave propagation through a planar helix.* BHU. Prof. R.K. Jha, Department of Electronics Engineering, Banaras Hindu University, Varanasi.

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13. Vaidya, Narendrakumar Gopalrao. *Studies on cross linked enzymes.* Nagpur. Dr. B.Y. Rao, L.I.T., Nagpur.

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All India Survey of Educational Administration (upto 30.9.1989)	1	1	1
Development & Efficient Functioning of Colleges (upto 31.7.1989)	1	—	—
International Diploma in Educational Planning and Administration (IDEPA) Programme (Upto 30.6.1989, but likely to continue)	—	1	1

PROJECT FELLOW (3 posts)

(Consolidated salary between Rs. 4700 to 5000 inclusive of House Rent Compensation of Rs. 800 p.m. to be regulated as per rules)

Qualifications

Essential

Should have consistently good academic record with first or high second class (B -) Master's degree in Education, Social Sciences, Sciences or disciplines allied to Educational Planning and Administration of an Indian University OR equivalent degree of a foreign university :

Either a doctorate degree of an Indian or foreign University OR published research work of a high standard OR outstanding academic contribution in the relevant area of the project.

At least 5 years of teaching conducting and or guiding research or equivalent administrative professional experience in relevant areas. Proven merit in writing editing documenting professional work.

Desirable

For **School Mapping and Educational Survey**, rich educational background and experience in the area of educational planning and administration and management systems of government, proficiency in quantitative methods and or regional planning.

For **Development and Efficient Functioning of Colleges**, good knowledge of functioning of collegiate system in India and capability to establish rapport with college and university authorities, teachers and students and the government.

Age : Below 45 years

PROJECT ASSOCIATE FELLOW (3 posts)

(Consolidated Salary between Rs. 2800 to 3100 p.m. inclusive of House Rent Compensation of Rs. 450 p.m. to be regulated as per rules)

Qualifications

Essential

A doctoral degree or equivalent published work with first or high second class Master's degree in Education, Social Sciences, Sciences or disciplines allied to Educational Planning and Administration or an equivalent degree of a foreign university.

Desirable

For **School Mapping & Educational Survey** 3 years experience in data collection, processing and analysis.

Rich educational background and experience in the area of educational planning, administration and management systems in government and proficiency in quantitative methods and/or regional planning.

For **I.D.E.P.A Programme** academic background in educational policy, planning and administration preferably with knowledge of and research experience in comparative education for 3 years.

Capability of drafting programme and research reports.

Age : Below 35 years.

BIOLOGICAL SCIENCES

Microbiology

1. Sharma, Nivedita. *Role of cellulolytic microbes in the degradation of physico-chemically treated forest biomass.* HP. Dr. T.C. Bhalla, Department of Biosciences, Himachal Pradesh University, Shimla.

Botany

1. Kalsi, Gurpreet. *Studies of plant lectins and their role in microbe-plant interactions.* Delhi. Dr. C.R. Babu, Department of Botany, University of Delhi, Delhi and Dr. R.H. Das, Council for Scientific and Industrial Research, New Delhi.

2. Malik, Pushpa. *Aerobiological and biochemical studies on some pollen of allergenic significance.* Delhi. Dr. C.R. Babu, Department of Botany, University of Delhi, Delhi, Dr. A.B. Singh, Council for Scientific and Industrial Research, New Delhi and Dr. S.V. Gangal, Council for Scientific and Industrial Research, New Delhi.

3. Om Prakash. *Specific gravity and tracheid length variations in West Himalayan spruce, Picea smithiana (Wall) Beiss.* HP. Dr. M.K. Seth, Department of Biosciences, Himachal Pradesh University, Shimla.

4. Shad, Onkar Singh. *Biological studies on Morcella species (Morels) of Himachal Himalayas.* HP. Dr. T.N. Lakhanpal, Department of Biosciences, Himachal Pradesh University, Shimla.

5. Sharma, Bindu. *Morphology, physico-chemical properties and cultivation aspects of 'Cauliflower' mushroom, Sparassis Spp.* HP. Dr. T.N. Lakhanpal, Department of Biosciences, Himachal Pradesh University, Shimla.

6. Vaneeta. *Seed physiology and biochemistry mechanism of seed deterioration during storage.* Delhi. Prof. R.N. Chopra, Department of Botany, University of Delhi, Delhi and Dr. P.K. Agarwal, Indian Agricultural Research Institute, New Delhi.

Zoology

1. Hari Prakash. *Biological control in insect pest management.* Delhi. Prof. S.S. Sehgal, Department of Zoology, University of Delhi, Delhi.

2. Kamia, Komal. *Cortical morphogenesis in hypotrichons ciliates.* Delhi. Dr. G.R. Sapra, Department of Zoology, University of Delhi, Delhi.

THESES OF THE MONTH

A List of Doctoral Theses accepted by Indian Universities.

PHYSICAL SCIENCES

Mathematics

1. Antherjanam, N. Nirmala. *Studies on korteweg-de vries equations.* CUST. Dr. M. Jathavedan, Lecturer, Department of Mathematics and Statistics, Cochin University of Science and Technology, Cochin.

2. Arjan Dev. *On some flow-shop scheduling problems.* Meerut. Dr. P.L. Maggu, Department of Mathematics, Institute of Management Technology, Ghaziabad.

3. Das, Braja Kishore. *A brief study of roots of a class of random polynomial.* Sambalpur. Dr. N.N. Nayak, Reader, Department of Mathematics, Orissa University of Agriculture and Technology, Bhubaneswar.

4. Paul, Akhil Chandra. *Distributional boundary values of functions Holomorphic in tubular radial domains.* BHU. Dr. R.S. Pathak, Reader, Department of Mathematics, Banaras Hindu University, Varanasi.

5. Shyam Narain. *Certain contributions to the study of summability of infinite series.* BHU. Dr. L.M. Tripathi, Reader, Department of Mathematics, Banaras Hindu University, Varanasi.

6. Singh, Brij Bhan. *On laminar boundary layers of incompressible flows.* BHU. Prof. K. Lal.

7. Singh, Lal Pratap. *Some aspects of nonlinear waves in radiating and electrically conducting glass.* BHU. Dr. V.D. Sharma.

Statistics

1. Gupta, Subhash Chand. *Some contributions to branching and allied processes.* HAU.

Physics

1. Bajpai, Rakesh. *Study of some mechanical properties of polycarbonates.* Durgawati. Dr. S.C. Datta, Prof. and Head, and Dr. J.M. Koller, Lecturer, Department of Physics, Rani Durgawati Vishwavidyalaya, Jabalpur.

2. Das, Salil Kumar. *Electrostatic and electromagnetic instabilities in plasmas.* IIT, Delhi. Prof. M.S. Sodha and Prof. D.P. Tewari, Department of Physics, Indian Institute of Technology, New Delhi.

3. Gera, Vivan Bala. *Electronic structure of III-V ternary and quaternary alloys.* IIT, Delhi. Prof. S.C. Abbi and Prof. K.P. Jain, Department of Physics, Indian Institute of Technology, New Delhi.

4. Manickkavachagam, R. *Studies in crystal structure analysis : Crystal structures of metallic sulphamates.* Madurai.

5. Mehta, Devinder. *Nuclear spectroscopic studies in certain nuclei.* Panjab.

6. Mukul Kumar. *On heating of the solar corona.* Meerut. Dr. Udit Narayan, Department of Physics, Meerut. College, Meerut.

7. Mulchandani, Anchal Mahesh. *Some aspects of colour centres and related phenomena in microcrystalline powders of alkali halides.* Nagpur. Dr. B.T. Deshmukh, Department of Physics, Nagpur University, Nagpur.

8. Nageswara Rao, Manne. *Some studies on equatorial spread-F using HF and VHF techniques.* Andhra.

9. Naik, Satchidananda. *Relativistic effects on hadronic structure.* Utkal.

10. Ram, Shakal Narain. *Hadronic properties of bottom particles, Gluonia and glue-balls.* BHU. Dr. C.P. Singh, Reader, Department of Physics, Banaras Hindu University, Varanasi.

11. Reghunath, A.T. *Studies on optical attenuation in oza water using dye laser and laser propagation in a turbulent medium.* CUST. Dr. V.P.N. Nampoori, Reader, Department of Physics, Cochin University of Science and Technology, Cochin.

12. Sarkar, Prasanta Kumar. *Collision frequency in F-region of the ionosphere.* Calcutta.

13. Sharma, Ashok Kumar. *Investigations on frequency stabilization of quarts crystals and associated instrumentation.* Meerut. Dr. A.S. Yadav, Department of Physics, MMH College, Ghaziabad and Dr. Ram Prashad Emeritus Scientist, National Physical Laboratory, New Delhi.

14. Singh, Kangujam Yugindro. *Some aspects of had-ronemulsion interactions at accelerator and cosmic ray energies.* Delhi.

15. Subrahmanyeswara Rao, Siram. *Experimental investigations in the decay of 124 Sb, 115m Cd, 110m Ag, and 153 Gd. nuclei using high resolution detectors.* Andhra.

16. Tiwari, Ram Prit. *Spectral studies of some substituted benzenes : Sys. trichloro, tribromo and trifluorobenzenes o-difluorobenzene, o-bromofluoro-benzene toluene h_8, toluene d_8, benzene d_6.* BHU. Prof. K.N. Upadhyaya, Reader, Department of Physics, Banaras Hindu University, Varanasi.

17. Tyagi, Udai Prakash. *Polytypism in melt and solution grown doped single crystals of cadmium iodide.* Delhi.

18. Venkoji Pathangi. *Vibrational and electronic spectra of certain substituted benzaldehydes.* Andhra.

19. Verma, Rajendra Prasad. *Annealing and radiation damage studies in some metals and alloys.* Devi Ahilya.

Chemistry

1. Adeyemi, Olufemi Olalekan. *Studies on the effect of some organic heterocycles on the acid corrosion of commercial copper.* Delhi.

2. Agrawal, Om Prakash. *Some Physico-chemical studies on calcium, barium, copper and zinc containing mixed hydroxy-lapatites.* Sambalpur. Dr. P.N. Patel, Lecturer, Department of Chemistry, G.M. College, Sambalpur.

3. Bhat, J. Ishwara. *Kinetic and mechanistic investigations with positive halogens in the liquid phase.* Mangalore. Dr. B. Thimme Gowda, Reader, Department of Chemistry, Mangalore University, Mangalore.

4. Dany, Chandra Mohan. *Studies on some copper and nickel complexes.* Sambalpur. Dr. Asoke Kumar Das, Principal, Bonaigarh College, Bonaigarh, Distt Sundargarh.

5. Das, Alak Kumar. *Charge transfer interaction in crystalline molecular complexes.* Calcutta.

6. Das, Asim Kumar. *Kinetics and mechanism of ligand substitution reactions at copper II, nickel II and palladium II centres.* Calcutta.

7. Das Gupta, Debasis. *Studies on the transport properties of tetraalkylammonium salts In 2-methoxy ethanol, 1, 2—dimethoxy ethane and their aqueous binary mixtures.* NBU.

8. Dhar, Hemendra Chandra. *Reaction mechanism of substitution reactions in diamino bis biguanide and diagua bis ethylene-diamine cobalt (III) complexes.* Burdwan. Prof. Sushil Kr Siddhanta, Prof. (Retd.), Department of Chemistry, University of Burdwan, Burdwan.

9. Fakhir, Thawra M. *Isolation and structural studies of senecio, lupinus and norsecurinine alkaloids.* Delhi.

10. Gour, Ramdhan Shankarlal. *Physico-kinetic studies of some drugs in relation to their biological activity.* Devi Ahilya.

11. Guha, Jayasri. *Studies in the synthesis of polycyclic compounds by rearrangement of spinanes and acylation by lactines.* Calcutta.

12. Gupta, Vibha. *Studies on complexing behaviour of oxygen, nitrogen and sulphur donor molecules with heavy metal ions.* Meerut. Dr. S.K. Sangal, Department of Chemistry, Meerut College, Meerut.

13. Islam, Nashreen S. *Studies on peroxo and hetero-ligand peroxo complexes of vanadium (V) and fluoro and mixed ligand-fluoro complexes of iron (III).* NEHU. Dr. M.K. Choudhury, Reader, Department of Chemistry, North Eastern Hill University, Shillong.

14. Jain, Archana. *Studies in some CH-active hetero-cycles.* BHU. Dr. A.K. Mukherjee, Reader, Department of Chemistry, Banaras Hindu University, Varanasi.

15. Jain, Raj Kumari. *Ultrasonic and thermo-dynamic studies of liquids and solutions.* Meerut. Dr. M.C. Jain, Reader and Head, Department of Chemistry, S.D. College, Muzaffarnagar and Dr. J.D. Pandey, Reader, Department of Chemistry, Allahabad University, Allahabad.

16. Khan, Iftikhar Ali. *IPSO-Nitration in some alkoxy benzenes.* Meerut. Dr. A.K. Manglik, Lecturer, Department of Chemistry, Meerut College, Meerut.

17. Koteswar Rao, Y. *Synthetic studies towards (±) — laurencne and some reactions of geminal disulfones.* Hydera-bad. Dr. M. Nagarajan.

18. Majee, Swapan. *Studies on some chelating ion-exchangers containing 1 : 3 diketogrouping.* Burdwan. Prof. Jyotirmoy Das, Department of Chemistry, University of Burdwan, Burdwan.

19. Malathi, N. *Synthesis of the pheromone of the fall armyworm moth z-9-tetradeeenyl acetate and some long chain amines, their quaternary salts from aleuritic acid.* Delhi.

20. Mukhopadhyay, Sankardeb. *Synthetic studies in cancer chemotherapy : Synthetic studies with 4 [N, N-Bis- (2-hydroxyethyl) amino] benzaldehyde.* Calcutta.

21. Nandi, Gopa. *Studies on natural products and related six membered heterocycles.* Calcutta.

22. Narayana, C. *Synthetic and mechanistic studies on the hydroboration of olefins with various borane Lewis base complexes.* Hyderabad. Dr. M. Pariasamy.

23. Narender, G. *Study of phenomena of interaction among resin, solvent and pigments and the properties of their dispersions and coatings.* Osmania.

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PROJECT FELLOW (3 posts)

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For *School Mapping & Educational Survey* 3 years experience in data collection, processing and analysis.

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For **I.D.E.P.A Programme** academic background in educational policy, planning and administration preferably with knowledge of and research experience in comparative education for 3 years.

Capability of drafting programme and research reports.

Age : Below 35 years.

PROJECT ASSISTANTS (3 posts)

(Consolidated salary between Rs. 2200 to 2500/- p.m. inclusive of House Rent Compensation of Rs. 450/- p.m. to be *regulated as per rules).*

Qualifications
Essential

Minimum Second Class Master's Degree in Education, Social Sciences, Sciences or disciplines allied to educational *planning and administration.*

Desirable

Experience in collection, compilation and analysis of data material relating to educational planning and administration.

For **School Mapping and Educational Survey**, experience of working on computers will be an additional qualification.

Age : Below 30 years.

II. CADRE POSTS

SENIOR STENOGRAPHER (English) : (1 post)
Rs. 1400-40-1600-50-2300-EB-60-2600.

Qualifications
Essential

A Bachelor's degree with minimum speed of 120 w.p.m. in shorthand and 40 w.p.m. in typewriting.

Desirable

Two years experience as Stenographer in a Government department organisation of repute.
Age : 18-28 years.

JUNIOR STENOGRAPHER (English) : (2 posts)
Rs. 1200-30-1560-EB-40-2040.
1 — Reserved for SC
1 — Reserved for ST

Qualifications

Higher Secondary or equivalent; minimum speed in English Shorthand 80 w.p.m and in typewriting 40 w.p.m. Preference will be given to persons possessing speed at 100 w.p.m. in Shorthand.
Age : 18-28 years.

LOWER DIVISION CLERK-CUM-TELEPHONE OPERATOR : (1 post)
Rs. 950-20-1150-EB-25-1500 plus Rs. 40/- p.m. special pay during the period of posting as Telephone Operator.

Qualifications
Essential

Higher Secondary or its equivalent; should possess Telephone Operator's certificate from a recognised institution *with one year's experience as Telephone Operator.*

Desirable

Knowledge of English Typing and fluency in conversation.

Age : 18-28 Years.

Cadre posts also carry the usual allowances as are admissible under the Central Government Rules.

Applications clearly specifying the post and the name of the project in case of project posts, with full bio-data particulars alongwith attested copies of certificates, a recent passport size photograph and a non-refundable crossed postal order of Rs. 8/- (no postal order is required in the case of SC/ST candidates) drawn in favour of Registrar, N.I.E.P.A., 17-B, Sri Aurobindo Marg, New Delhi-110016, should reach the Registrar latest by **20.9.1988. Separate application be made for each post.**

Project posts may involve touring. Qualifications and age are relaxable for otherwise well qualified candidates. Candidates from outside Delhi called for interview will be paid single return train second class fare by shortest route. Candidates already in employment in Government/Semi-Government Departments, Autonomous Bodies should send their applications through proper channel.

Other things being equal, preference will be given to SC/ST candidates.

R.P. Sexana
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Advertisement No. 2/88

Applications on the prescribed form are invited for following posts :

I. Posts in the grade of Rs. 1500-2500 (Pre-revised) plus rent free unfurnished accommodation or allowance at the rate of 10% of pay

1. Director of Research
2. Director of Extension Education
3. *Students Welfare Officer*

Qualifications

Post at Sr No. 1 : (1) Ph. D. degree or its equivalent in Horticulture/ Forestry or in their allied Sciences.

(2) 10 years' teaching research experience in a relevant field out of which atlest 5 years' experience should be as Professor or equivalent rank.

(3) A significant contribution and accomplishment in the field of teaching research extension education as evidenced by publications articles in a journal of repute.

(4) Ability to organise, supervise and co-ordinate research in the field of Horticulture, Forestry and Allied Sciences.

Post at Sr. No. 2 : (1) Ph. D. degree or its equivalent in Horticulture Forestry or in their allied Sciences.

(2) 10 years' teaching research/ extension education experience in a relevant field out of which atleast 5 years' experience should be as professor or equivalent rank.

(3) A significant contribution or accomplishment in the field of research/ education/extension education as evidenced by publications.

(4) Ability to organise, supervise and co-ordinate extension education activities in the field of Horticulture, Forestry and Allied Sciences.

(5) He should preferably be conversant with the conditions of Horticulture and Silvi-Horticulture practices of Himachal Pradesh.

Post at Sr. No. 3 : (1) Atleast 2nd Class Master's degree in any discipline.

(2) Adequate experience or organising sports games and other students' welfare activities for a period of not less than 10 years.

(3) Must have played at the National level.

II. Librarian in the grade of Rs. 1500-2500 (Pre-revised)

Qualifications

(1) Ph.D. degree in Library Science from recognised University Institution.

(2) Not less than 10 years' experience of work in a Library of repute and good knowledge of modern library system or five years' or above as Deputy Librarian in a University or an Institution of comparable standard.

Note : Relaxable to 2nd Class Master's degree in Library Science from a recognised University Institution in case of a candidate having 10 years' experience as Deputy Librarian in a University Library.

III. Posts in the grade of Rs. 1500-2500

1. Professor of Post Harvest Technology –(1)

(2) Professor of Bio-Technology –(1)

(3) Professor of Floriculture and Landscaping–(1)

(4) *Professor of Forest Products* and Utilization–(1)

Qualifications –General

(1) Ph.D. degree or equivalent in the subject with consistently good academic record.

(2) 10 years' teaching/research/ extension education experience in the *subject out of which atleast 5 years* experience should be as Associate Professor/equivalent.

(3) Significant contribution as evidenced by publications, articles in a journal of repute.

(4) *Ability to provide leadership to* the department.

Qualifications –Specific

Post at Sr. No. 1 : Ph.D. in Horticulture/Pomology/Food Technology with specialization in Post Harvest Technology, Fruits, Vegetables and Foods.

Post at Sr. No 2 : Ph.D. in Genetic/ Cytogenetic/Molecular Biology/Botany with specialization in Cell Biology/ Molecular Biology.

Post at Sr. No. 3 : Ph.D. in Floriculture/Landscaping/Horticulture with specialization in Floriculture and/or Landscaping.

Post at Sr. No. 4 : Ph.D. in Forestry with specialization in any of the subjects like Wood Science, Timber Utilization, Logging, Wood Processing, Forest Products, Medicinal and Aromatic Plants with consistently good academic record.

IV. Post in the grade of Rs. 1200-1900

1. Associate Professor of Floriculture and Landscaping–(1)

2. Associate Professor of Agril Economics and Sociology–(1)

3. *Associate Professor of Extension* Education –(1)

4. Associate Professor of Wild Life –(1)

5. Horticulturist–(1)

6. Scientist of Fruit Breeding –(1)

7. Extension Specialist of Mycology and Plant Pathology–(1)

Qualifications–General

(1) Ph.D. degree or equivalent in the subject with consistently good academic record.

(2) 5 years' teaching/research/ extension education experience in the subject.

(3) Significant contribution as evidenced by publications, articles in a journal of repute.

Qualifications–Specific

Post at Sr. No. 1 : Ph.D. in Floriculture/Landscaping/Horticulture with specialization in Floriculture and/or Landscaping.

Post at Sr. No. 2 : Ph.D. in Agriculture Economics and Rural Sociology.

Post at Sr. No. 3 : Ph. D. in Agriculture Extension Education.

Post at Sr. No. 4 : Ph. D. in Forestry/ Zoology with specialization in wild life.

Post at Sr. No. 5 : Ph. D. in Horticulture with specialization in Pomology/ Fruit Culture/Orchard Management.

Post at Sr. No. 6 : Ph. D. in Horticulture/Pomology with specialization in Fruit Breeding.

Post at Sr. No. 7: Ph. D. in Mycology and Plant Pathology with experience on plant protection preferably in Extension.

V. Posts in the grade of Rs. 700-1600

1. Assistant Professor of Botany—(1)
2. Assistant Professor of Bio-Technology—(1)
3. Assistant Professor of Fruit Breeding and Genetic Resources—(1)
4. Assistant Professor of Forestry—(1)
5. Assistant Scientist of Agril. Economics—(1)
6. Assistant Scientists of Vegetable Crops—(2)
7. Assistant Scientists of Horticulture—(4)
8. *Assistant Scientists of Mycology* and Plant Pathology—(3)}
9. Assistant Entomologist—(1)
10. Assistant Agronomist—(1)
11. Assistant Scientist of Forestry—(1)
12. Assistant Scientists of Agril. Statistics and equivalents—(3)
13. Assistant Horticultural Technologist—(1)
14. Assistant Extension Specialist of Post Harvest Technology—(1)
15. Assistant Extension Co-ordinator—(1)

Qualifications

Post at Sr. No. 1 : Ph.D. in Botany with specialization in systematic botany/dentrology.

Post at Sr. No. 2 : Ph.D. in Genetics with specialization in plant Bio-technology.

Post at Sr. No. 3 : Ph.D. in Horticulture/Pomology/Genetics/Plant Breeding with specialization in Fruit Breeding.

Post at Sr. No. 4 : Ph.D. in forestry.

Post at Sr. No. 5 : Ph.D. in Agriculture Economics.

Post at Sr. No. 6 : Ph.D. in Vegetable Crops Olericulture.

Post at Sr. No. 7 : Ph.D. in Horticulture with specialization in Pomology.

Post at Sr. No. 8 : Ph.D. in Plant Pathology with specialization in Fruit Pathology/Apple scab.

Post at Sr. No. 9 : Ph.D. in Entomology with specialization in fruit entomology.

Post at Sr. No. 10 : Ph.D. in Agronomy.

Post at Sr. No. 11 : Ph.D. in forestry with specialization in Genecology/tree cytology.

Post at Sr. No. 12 : Ph.D. in Agriculture Statistics.

Post at Sr. No. 13 : Ph.D. in Horticulture/Pomology Food Technology with specialization in fruit and vegetable preservation.

Post at Sr. No. 14 : Ph.D. in Horticulture with specialization in post harvest technology.

Post at Sr. No. 15 : Ph.D. in Extension Education Agriculture Extension/ Horticulture Forestry and allied discipline.

Note : (1) For posts at Sr. No. III (4) and IV (4)

In case a suitable candidate with Ph.D. (forestry) is not available, then a candidate having M.Sc. (forestry)/M.Sc. with AIFC would also be eligible.

(2) For posts at Sr. No. V (1 to 15) in the scale of Rs. 700-1600

(i) Ph.D. degree in the concerned subject relaxable to M.Sc. (for posts at Sr. No. 4 and 11 M.Sc. forestry/M.Sc. with AIFC) with consistently good academic record.

(ii) In case a candidate selected for appointment holds Master's degree, he will have to obtain Ph.D. degree within 8 years of the date of appointment failing which he shall cease to earn increment(s) till he obtains Ph.D. degree.

VI. Non-teaching posts (State-scale)

1. Instrumentation Engineer—(1) (Rs. 940-1850)
2. Photographer—(2) (One Res. for SC) (Rs. 570-1080)
3. Artist-cum - Photographer— (1) (Rs. 570-1080)
4. Auto-Electrician—(1) (Rs. 400-600)
5. Semi-Professional Assistant (Reserved for SC)—(1) (Rs. 450-800)

Qualifications

Post at Sr. No. 1 : Bachelor Engineering in Electronics with two years experience in design and maintenance of micro processer based instruments.

OR

3 years diploma in Electronics with 5 years working experience in an Institute of repute.

Post at Sr. No. 2 : Atleast matriculate having a post-matric certificate/diploma in Photography for a minimum duration of one year from recognised University/ Institution.

OR

Atleast matric having 3 years experience in microphotography and field photography and conversant with developing, printing and positive slide preparation etc., the candidate will be asked to give a practical demonstration of the knowledge and ability.

Post at Sr. No. 3 : Matric with 3 years experience in photography (Black and White, Coloured) and dark room work. Preference will be given to the candidates with diploma course in Commercial Art and Video Photography.

Post at Sr. No. 4 : National Trade Certificate with three years experience as Auto-Electrician in Government or reputed workshop.

OR

Middle with about 4 years experience in the line, should have full knowledge of Dynamo repairs, Armature winding, battery charging and other minor and major electrical repairs of vehicles. Capable to using electrician testing apparatus of all kinds used in fault detection, electric machine and components.

Post at Sr. No. 5 : (1) Matric 2nd division or Higher Secondary of a recognised University/Board and Certificate in Library Science.

(2) Candidate shall have to qualify type test with a speed of 30 WPM within a period of one year, failing which he/she shall not be eligible to earn annual increment.

General Instructions

1. Higher pay admissible in the case of meritorious candidates.

2. Applicants already in service must send their applications through proper channel.

3. The University reserves the right not to fill up any of the posts advertised.

4. Applications received after the last date fixed therein may be rejected without making any reference to the candidate. Applications on plain paper also liable to be reject ed

5. Benefits of Contributory Provident Fund-cum-Gratuity and leave etc., as per University rules.

6. Other allowances on pay will be permissible as per rules of the University from time to time.

7. Other things being equal, preference will be given to SC/ST candidates, who are considered fit, for the posts under Sr. No. V (1 to 15).

Application forms can be had from the Registrar, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Post Office Nauni, District Solan (Himachal Pradesh)-173230 by sending application fee of Rs. 10/- in the shape of crossed Indian Postal Order(s) payable to the Comptroller of this University alongwith a self-addressed envelope of size 23 x 10 cms.

Applications complete in all respects with attested copies of testimonials should reach the Registrar by **30.9.1988.**

Candidates applying from abroad may send their applications on plain paper giving particulars of date of birth, examination passed (from High School onwards) with division and percentage of marks obtained in the various examinations teaching research extension experience with a list of publications, if any, so as to reach the Registrar by **15.10.1988.**

B. S. Nainta
REGISTRAR

TATA INSTITUTE OF SOCIAL SCIENCES

DEONAR, BOMBAY-400 088

Announces

Post M.A. Certificate in Research Methodology (one semester Commencing from November 28, 1988).

Eligibility : Master's Degree in one of the social sciences or social work of a recognized university with an overall of 50 per cent of the marks or an average 'B' grade. Candidates who have appeared for the qualifying examination may apply in anticipation of their results.

Objectives : The programme is designed specially to equip post M.A. scholars with the requisite knowledge and skills in social research methodology so that they can carry out research projects (doctoral and other) with competence and confidence.

A copy of the prospectus and application can be obtained from the Assistant Registrar (Academic) of the Institute by sending a Demand Draft of a Bank for Rs. 25/- in favour of the Institute.

The last date for receipt of the completed application form with a registration fee of Rs. 25/- is October 31, 1988.

N. Krishnamoorthy
REGISTRAR

BHARATHIAR UNIVERSITY
COIMBATORE-641 046

Advertisement No. 7460/B5/88

Dated : 17th August '88

Applications are invited for the following posts :

1. Department of Mathematics

No. of Posts

Professor 1 (SC ST)
Reader 2 (SC ST-1; BC-1)

Specialisation

Computer Mathematics Programming Languages Operations research Functional Analysis Optimisation Techniques Differential Equations Algebra fluid mechanics.

2. Department of Statistics

Professor 1 (SC ST)
Reader 2 (OC-1; BC-1)
Lecturer 1 (SC ST)

Specialisation

Sampling (Theory and Practice) Design of experiments Statistical Quality Control Reliability Statistical Inference.

3. Department of Botany

Professor 1 (SC ST)

Specialisation

Plant Biochemistry Forest Botany
Lecturer 2 (OC-1, SC ST-1)

Specialisation

Plant Genetics Plant Anatomy Ethnobotany

4. Department of Physics

Reader 1 (SC ST) : Laser Physics
Lecturer 2 (SC ST-1, OC-1)

Specialisation

Applied optics Thin film Physics Solid State devices Super conductivity.

5. Department of Chemistry

Reader 1 (SC ST)

Specialisation

At the M Sc. Level : General chemistry Organic Chemistry (special)

At the Ph D Level

(i) Heterocyclic Chemistry
(ii) Organic Photochemistry
(iii) Natural products chemistry

Lecturer 2 (SC ST 1; BC-1)

Specialisation

At the M.Sc. Level : General chemistry Organic chemistry (Special) Physical chemistry Polymer Chemistry ; **at the Ph.D. Level** : Modern Reagents Organic Photochemistry Electro Chemistry Quantum chemistry Spectroscopy Fibre-Chemistry Solid state chemistry Molecular Dynamics.

6. Department of Environmental Studies

Professor 1 (OC)
Reader 1 (SC ST)
Lecturer 2 (SC ST-1; BC-1)

Specialisation

Environmental genetics/Microbiology Environmental Physiology/Environmental pollution and toxicology.

7. Department of Economics

Reader 2 (OC-1; SC ST-1)

Specialisation

Agricultural Economics Econometrics/Applied Economics Industrial Economics
Lecturer 1 (SC ST)

Specialisation

Local Finance Industrial Economics Econometrics Cooperation Agricultural Economics.

8. Department of Sociology

Professor 2 (OC-1; SC ST-1)

Specialisation

Industrial Sociology Rural Development Rural Sociology.
Reader 1 (SC ST)

Specialisation

Urban Sociology Rural Development Rural Sociology.

9. Department of Psychology

Reader 1 (SC ST)

Specialization in personality and guidance experience at M. Phil & Ph.D.
Lecturer 1 (OC)

Specialization in Personality and Motivation - Counselling—applied Psychology.

10. Department of Population Studies

Professor 1 (SC ST)
Reader 2 (OC-1; SC ST-1)

Specialisation

Population Economics Social Demography Migration Fertility.

Qualification & Experience

1. Professor

Consistently good academic record with first or second class (not below 55% or 'B' plus) Post-Graduate degree in the subject or related subject and a Ph. D. degree in the subject with not less than 10 years of Post-Graduate teaching and or research experience out of which not less than 3 years should be in a cadre not below than that of a Reader in the University and published research work of high standard. Evidence of being actively engaged in research and experience in guiding research work at Doctoral level.

2. Reader

Consistently good academic record with first or second class (not below 55% or 'B' plus) Post-Graduate degree in the subject or related subject and a Ph.D. Degree in the subject with not less than 5 years of Post-Graduate teaching and/or research experience out of which not less than 3 years should be in a cadre not below than that of a Lecturer in the University and published research work of high standard. Evidence of being actively engaged in research and experience in guiding research.

3. Lecturer

Consistently good academic record with first or second class (not below 55% or 'B' plus) Post-Graduate Degree in the subject or related subject and a Ph.D. degree in the subject with not less than 2 years of Post-Graduate teaching and/or research experience.

Desirable

Publication of research work of high standard in the subject.

Scale of Pay

Professor : Rs. 1500-60-1800-100-2000-125-2500.
Reader : Rs. 1200-50-1300-60-1900.
Lecturer : Rs. 700-40-1100-50-1600.

(To be revised as per UGC scales of pay.)

The Syndicate reserves the right to fill or not to fill any or all of the above posts.

Maximum Age as on 1-8-1988

For Professors : 50 years.
For Readers : 45 years.
For Lecturers : 40 years.

Application forms can be had from the Registrar, Bharathiar University, Coimbatore-641 046 on requisition *accompanied by a self-addressed* Rs. 1.40 paise stamped envelope (25 cm. × 10 cm). Attested copies of certificates showing qualifications, age, community, experience, etc., should be sent along with the application in the prescribed form (in Eight copies) together with Registration Fee of Rs. 10/- in the form of crossed Indian Postal Order dated not earlier than 1-8-'88 drawn in favour of the Registrar, Bharathiar University, Coimbatore-641 046.

Any candidate applying for more than one post submit separate applications for each post.

Candidates *in service shall submit* their application through proper channel.

Completed applications should reach

the Registrar on or before 20th September, 1988.

Incomplete applications and applications without the required registration fee will not be considered.

Note 1. Those who have applied earlier in response to the advertisements No. 6998/E1/87, dated 29-10-'87 and 2-1-1988, need not apply again.

2. In case SC/ST and BC candidates with suitable Qualification and Experience are not available other candidates will be considered against these vacancies as per Roster Norms.

REGISTRAR

VICTORIA JUBILEE TECHNICAL INSTITUTE

MATUNGA, BOMBAY-400 019

Advt. 1/1988—Degree

Vacant Posts (Degree Staff)

Professors

*1. Mechanical Engineering (Automobile Engg.)—1 post (for S.T. Category) (3rd Advt.)

2. Electronic Engineering—1 post

*3. Computer Engineering—1 post

*4. Computer Application—1 post (for S.C. Category) (1st Advt.)

4(a) Production Engineering—1 post

Assistant Professors

5. Electrical Engineering—1 post (for S.T. Category) (1st Advt.)

6. Industrial Engineering—1 post (for S.C. Category) (2nd Advt.)

7. Technical Chemistry (Paints Technology/Foods)—2 posts (one for S.C. Category) (2nd Advt.)

8. Electronic Engineering—1 post

9. Computer Engineering—1 post

*10. Computer Application—1 post

Lecturers

11. Mechanical Engineering—2 posts (one for S.C. Category & one for S.T. Category) (2nd Advt.)

12. Mechanical Engineering (Material Technology)—1 post.

13. Production Engineering—1 post (for S.C. Category).

14. Civil Engineering—1 post.

15. Civil Engineering—5 posts (one for S.C. Category & one for S.T. Category) (2nd Advt.) (one for S.C. Category) (1st Advt.)

16. Electronic Engineering—3 posts (one for S.C. Category) (2nd Advt.)

17. Computer Engineering—3 posts (one for S.T. Category) (1st Advt.)

*18. Computer Application—3 posts (one for NT & DT Category) (2nd Advt.)

19. Structural Engineering—2 posts (one for NT & DT Category) (2nd Advt.)

20. Lecturer-cum-Asst. Workshop Superintendent (Weaving) Text. Deptt.—1 post (for S.C. Category) (2nd Advt.)

Lecturers

21. Lecturer in Chemistry (Non-Technical)—2 posts (one NT & DT Category) (2nd Advt.)

22. Lecturer in Textile Physics—1 post.

(* These posts are under post-graduate scheme).

Posts reserved for backward class candidates are interchangeable among the different categories of the backward classes.

If suitable backward class candidates are not available open category candidates found suitable may be appointed on temporary basis.

Scales of Pay

Professors : Rs. 1500-60-1800-100-2000-125/2-2500.

Assistant Professors : Rs. 1200-50-1300-60-1900.

Lecturers (Technical) : Rs. 700-40-1100-50-1600.

Lecturer Non-technical : Rs. 700-40-1100-50-1300-Assessment-50-1600.

Gross Emoluments

Position	At the minimum of the scale	At the maximum of the scale
	Rs.	Rs.
Professor	4162.50	6514.00
Asst. Professor	3789.50	5122.00
Lecturer	2570.00	4352.00
Lecturer-cum-Asst. Workshop Supdt.	2570.00	4352.00

Capable and motivated candidates will have adequate opportunities for teaching at Post-graduate level, conducting research and getting associated with industry sponsored projects and econsultancy work.

Age Limit : Not more than 35 years (relaxable in exceptional cases).

Applicants who are already employed shall send their applications through proper channel.

Breaks in academic career if any, should be accounted for.

Qualifications for various posts are as prescribed by the University of Bombay.

Details regarding qualifications etc. and the application forms are obtainable from the Office of the Principal & Secretary on request with self-addressed envelope (10 cm. × 22 cm.) stamped Rs. 3/-. Applications in the prescribed form complete in all respects, must reach V.J.T.I. on or before **30th Sept., 1988.**

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